DEPARTMENT OF THE INTERIOR,

CENSUS OFFICE.

FRANCIS A. WALKER, Superintendent,
Appointed April 1, 1879; resigned November 3, 1881.

CHAS. W. SEATON, Superintendent,
Appointed November 4, 1881.

REPORT

ON THE

FORESTS OF NORTH AMERICA

(EXCLUSIVE OF MEXICO),

BY

CHARLES S. SARGENT,
ARNOLD PROFESSOR OF ARBORICULTURE IN HARVARD COLLEGE,
SPECIAL AGENT TENTH CENSUS.

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1884.

LETTER OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,
CENSUS OFFICE,
Washington, D. C., September 1, 1884.

HON. H. M. TELLER,
Secretary of the Interior.

SIR: I have the honor to transmit herewith the Report on the Forests of North America (exclusive of Mexico), by Charles S. Sargent, Arnold Professor of Arboriculture in Harvard College.

This report constitutes the ninth volume of the series forming the final report on the Tenth Census.

I have the honor to be, most respectfully, your obedient servant,

CHAS. W. SEATON,
Superintendent of Census.

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LETTER OF TRANSMITTAL

BROOKLINE, MASSACHUSETTS, *July* 1, 1883.

TO THE SUPERINTENDENT OF CENSUS.

SIR: I have the honor to submit the following report upon the nature and condition of the forests of the United States, to which are added statistics of the lumber and other industries directly dependent upon the forest for their support.

Mr. Andrew Robeson, of Brookline, Massachusetts, has prepared the maps which accompany this report; he has supervised the entire statistical work of this division and has conducted its correspondence.

Mr. Stephen P. Sharples, of Cambridge, Massachusetts, has conducted the various experiments undertaken with the view of determining the value of the different woods produced in the forests of the United States.

Mr. C. G. Pringle, of East Charlotte, Vermont, has examined the forests of northern New England and New York, Pennsylvania, and West Virginia; and subsequently, as an agent for the American Museum of Natural History, has greatly increased our knowledge of the trees of Arizona and southern California.

Mr. A. H. Curtiss, of Jacksonville, Florida, has studied the forests of Georgia and Florida, and subsequently, as an agent of the American Museum of Natural History, has added to our knowledge of the semi-tropical forests of southern Florida.

Dr. Charles Mohr, of Mobile, Alabama, has explored the forests of the Gulf states.

Mr. H. C. Putnam, of Eau Claire, Wisconsin, has gathered the forest statistics of Pennsylvania, Michigan, Wisconsin, and Minnesota.

Mr. George W. Letterman, of Allenton, Missouri, has examined the forests extending west of the Lower Mississippi River, and Professor F. L. Harvey, of Fayetteville, Arkansas, has gathered the forest statistics of that state.

Mr. Sereno Watson, of Cambridge, Massachusetts, has studied, during a long and arduous journey, the forests of the northern Rocky Mountain region, and Mr. Robert Douglas, of Waukegan, Illinois, those of the Black hills of Dakota.

I take this opportunity to call your attention to the faithful and admirable manner in which my associates have performed the difficult duties to which they were assigned; their zeal and intelligence have made possible the preparation of this report.

It is my pleasant duty also to call your attention to the fact that this investigation has been greatly aided from the first by the experience and knowledge of Messrs. G. M. Dawson, John Macoun, and Robert Bell, members of the Geological Survey of Canada; the information in regard to the distribution northward of the trees of the eastern United States is entirely derived from the latter's paper upon the Canadian forests, published in the Report of the Geological Survey of Canada for the years 1879–'80.

I am under special obligation to Dr. George Engelmann, of Saint Louis, Missouri, my companion in a long journey through the forests of the Pacific region, for valuable assistance and advice; his unrivaled knowledge of our oaks, pines, firs, and other trees has been lavishly placed at my disposal.

Mr. M. S. Bebb, of Rockford, Illinois, the highest American authority upon the willow, has given me the benefit of his critical advice in the study of this difficult genus. I desire to express to him and to Dr. Laurence Johnson, of New York, who has furnished me with a full series of notes upon the medical properties of the trees of the United States, the deep sense of my obligation. My thanks are also due to Mr. Henry Gannett, Geographer of the Tenth Census, for cordial co-operation in the work of this division; to Colonel T. T. S. Laidley, of the United States army, in command of the arsenal at Watertown, Massachusetts, and to Mr. James E. Howard, in charge of the testing machine there, for advice and assistance afforded Mr. Sharples while conducting the experiments upon the strength of woods, as well as to a large number of correspondents in all parts of the United States who have favored me with their cordial co-operation.

I am, sir, your obedient servant,

CHARLES S. SARGENT,
Special Agent.

WESTERN DIVISION.

MONTANA.

The forests of Montana are confined to the high mountain ranges which occupy the western part of the territory. They are dense and important upon the slopes of the Cœur d'Alêne and other high ranges. Farther east, along the eastern slopes of the Rocky mountains and their outlying eastern ranges, the Big Belt, the Little Belt, the Crazy, the Snow, and the Bear mountains, and the ranges south of the Yellowstone river, the Yellowstone, Shoshonee, and Big Horn mountains, the forests are more open, stunted, and generally confined to the highest slopes, the borders of streams, or the sides of cañons. A narrow fringe of cottonwood, green ash, and willow lines the bottoms of the Missouri, Yellowstone, Tongue, Rosebud, Milk, and of the other large streams of the territory; and a few stunted pines and cedars are scattered along the river bluffs and the highest ridges of the Powder River, the Wolf, and other ranges in the southeastern part of the territory. The remainder of the territory, the eastern, northern, and southern portions, are destitute of timber.

The heavy forests of northwestern Montana, largely composed of red fir, yellow pine, and tamarack, and containing great bodies of white pine (*Pinus monticola*) and considerable valuable spruce (*Picea Engelmanni* and *P. alba*) constitute, with those covering the adjacent mountains of Idaho, one of the most important bodies of timber in the United States. East and west of this forest a treeless country, adapted to grazing and agriculture, and destined to support a large population which must obtain its building material and railroad supplies from it, extends over thousands of square miles. The development, too, of the important mining interests of southern Montana and Idaho is dependent upon these forests, their only valuable source of timber and fuel supply. These forests guard the headwaters of two of the great rivers of the continent, and in regulating their flow make possible through irrigation the devotion to profitable agriculture of a vast territory now an almost arid waste. The forests, largely composed of the lodge-pole pine (*Pinus Murrayana*), which cover the outlying eastern ranges of the Rocky mountains at an elevation of from 5,000 to 10,000 feet above the ocean level with a dense growth of slender trees or on poor soil and in exposed situations with an open, scattered forest, are, as sources of lumber supply, of comparatively little value. These forests, however, contain valuable supplies of fuel and abundant material for railway ties. They guard, too, the flow of numberless small streams, and their importance in this connection should not be overlooked.

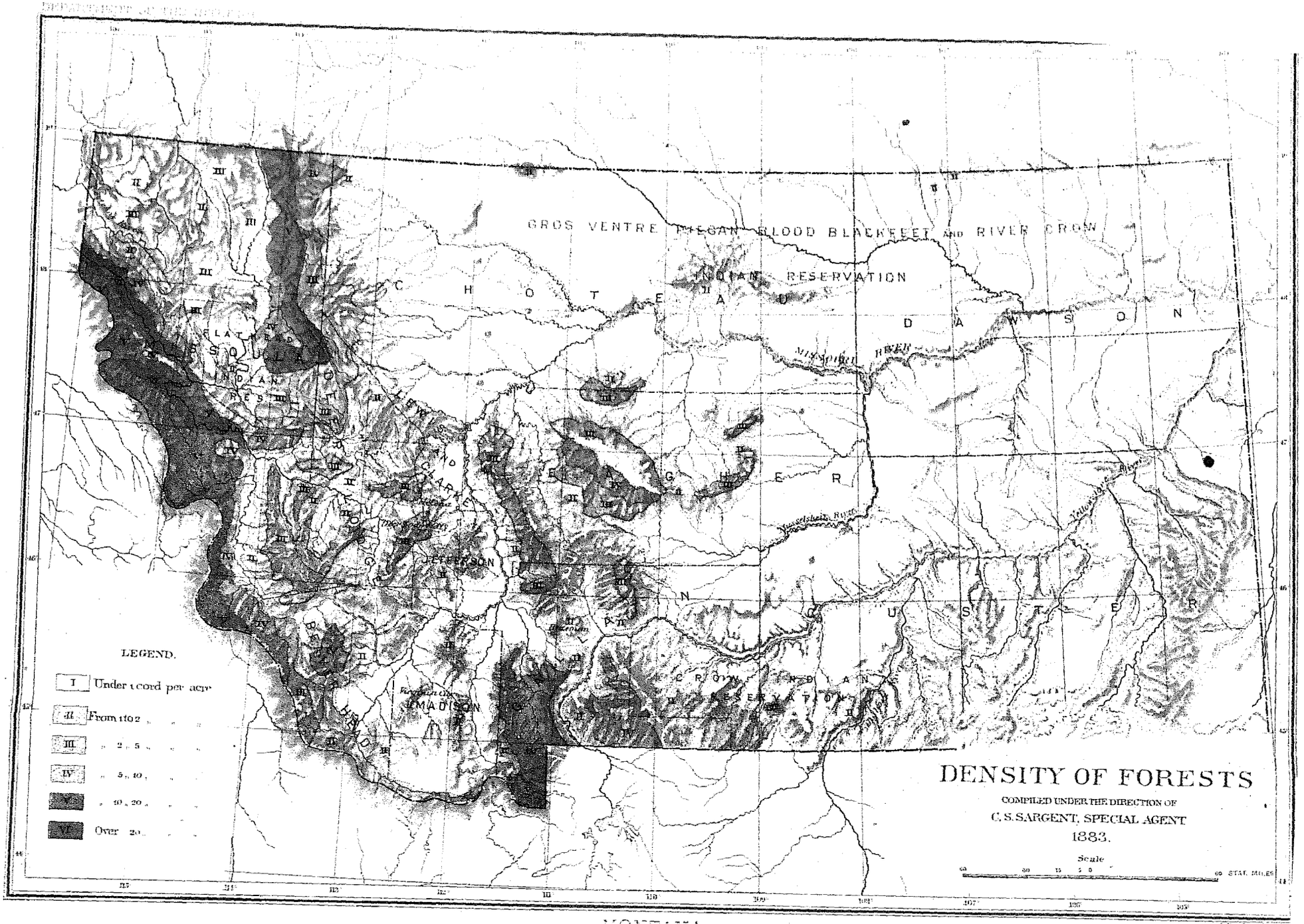
The most important forests, commercially, of the territory are found along the valley of Clarke's Fork of the Columbia river, between the Horse Plains and the Idaho line; here the western white pine reaches its greatest development, becoming an important part of the forest growth. The valleys of the Saint Regis de Borgia and Missoula rivers contain great bodies of valuable fir and pine, which spread also in great luxuriance over the mountains east and south of Flathead lake.

Fires destroy every year large areas of the forest covering the mountains of the western division. The long, dry summers and the character of the forest, composed as it is almost entirely of coniferous resinous trees, favor the spread of forest fires. They increase rapidly in number with the increase of population, and threaten the entire extermination of the forests of the whole interior Pacific region. During the census year 88,020 acres of forest were reported destroyed by fire, with a loss of $1,128,000. These fires, few in number, were traced for the most part to careless hunters, prospectors, and smokers.

Little lumber is manufactured in the territory. Red fir and spruce are sawed at Missoula and in the neighborhood of nearly all the mining centers in the western part of the territory. The product of the Montana mills is entirely used to supply the local demand.

The following report upon the forests of the northern Rocky Mountain region was prepared by Mr. Sereno Watson, of Cambridge, a special agent of the Census Office, in the division of Forestry:

"The territory whose forest resources I attempted under your instructions to examine includes an area of about 150,000 square miles, extending from the one hundred and thirteenth meridian to the summit of the Cascade mountains and from the parallel of 44½° to the British boundary; or, according to political divisions, the western fifth of Montana, the northern two-fifths of Idaho, the eastern three-fifths of Washington territory, and the northeastern portion (or nearly one-half) of Oregon. It comprises a central treeless plateau of some 30,000 square miles in extent, the great 'plain of the Columbia', surrounded by more or less extensively timbered mountain systems. This tract is bounded on the east by the broad mountain range which separates Montana from Idaho, on


GROS VENTRE PIEGAN BLOOD BLACKFEET AND RIVER CROW
INDIAN RESERVATION
C H O T E A U
D A W S O N
FLATHEAD
INDIAN RES
MISSOULA
LEWIS AND CLARK
JEFFERSON
MADISON
GALLATIN
PARK
CROW INDIAN RESERVATION
YELLOWSTONE
LEGEND.
I Under 1 cord per acre
II From 1 to 2 " "
III " 2 " 5 " "
IV " 5 " 10 " "
V " 10 " 20 " "
VI Over 20 " "
DENSITY OF FORESTS
COMPILED UNDER THE DIRECTION OF
C. S. SARGENT, SPECIAL AGENT
1883.
Scale
60 30 15 7 0 60 STAT. MILES

MONTANA

the north by the irregularly-broken country which lies north of the Spokane river and of that portion of the Columbia which has a westerly course in the same latitude, and on the west by the Cascade range, while on the south the circuit is less completely closed by the somewhat complicated system known as the Blue and Salmon River mountains.

"With the exception of a single county (Beaver Head) in Montana this entire region is drained by the Columbia river, since the Rocky Mountain divide, or the main central divide between the headwaters of the Columbia and of the Missouri, forms the boundary between Idaho and Montana only as far north as 45° 40′, when it turns abruptly eastward for 75 miles and then again northwestward to the British boundary in continuation of the line of the Wind River mountains of Wyoming.

"As will be seen from the detailed account which is to follow, the general character of the forest growth throughout this region is remarkably uniform, both in the kinds of trees found and in their manner of distribution. The trees of the most constant occurrence and that form the mass of the forests generally are, first, the red fir (*Pseudotsuga Douglasii*) and yellow pine (*Pinus ponderosa*), gradually giving place at higher altitudes to *Picea Engelmanni* and *Abies subalpina* or *Pinus Murrayana;* while of only somewhat less extended range, though sometimes more local in their distribution, are the larch (*Larix occidentalis*), cedar (*Thuya gigantea*), the white pine (*Pinus monticola*), the hemlocks (*Tsuga Mertensiana* and, less frequently, *Tsuga Pattoniana*), *Abies grandis*, and the balsam poplars. *Abies amabilis* only is confined to the Cascade mountains. No other species occur of sufficient size to be of importance as timber trees.

"In order to indicate more particularly the extent and distribution of the tree growth, the territories will be taken up in order by counties, and an estimate given of the area covered in each, though necessarily of the actual density of growth and amount of available timber (varying from square mile to square mile, and much of it never seen) no estimate can be given of such probably approximate accuracy as to be of any value whatever:

"MONTANA.

"BEAVER HEAD COUNTY (4,230 square miles).—This county, nearly equally divided by the one hundred and thirteenth meridian, is surrounded on three sides, north, south, and west, by the Rocky mountains, and is divided into two portions by a lofty spur which sets off in a northeasterly direction from the middle of the western side. The valleys of Beaver Head river and Red Rock creek to the east and south of this spur are treeless, except that the latter stream is bordered with a considerable growth of *Populus angustifolia*, often 60 feet high and a foot or two in diameter. The region to the east is scantily supplied with timber of any kind, while the northern flanks of the Rocky Mountain range as far as the head of Horse Plains creek are only sparingly timbered on the ridges and in some of the cañons, the trees small and mainly red fir, with some *Pinus albicaulis*, the summits and exposed ridges wholly bare.

"The broad dividing spur, which includes Bald mountain and several other peaks from 10,000 to 11,000 feet high, is about 30 miles in length by 20 in breadth. The peaks are bare above 9,000 feet, and the western slopes have some timber in the upper ravines alone. The trees at 7,000 feet are mainly red fir, giving place above to a small growth of *Pinus Murrayana* and *P. albicaulis*. On the eastern side of the spur there are deep, densely-wooded valleys, the timber said to be chiefly red fir, *Picea Engelmanni* and *Pinus Murrayana*. On Rattlesnake creek in this region there is a single saw-mill, 12 miles from Bannock City, which supplies the town and neighboring mining camps with lumber. When a better quality is needed it is brought across the mountains from the Lemhi River district in Idaho by a road crossing the range at the head of Horse Plains creek. The fuel used in Bannock City is hauled some 12 or 15 miles, chiefly from the Rocky mountains. Beyond the head of Horse Plains creek (where the Bald Mountain spur commences) the range for about 40 miles changes in character greatly, becoming higher, broader, and more rocky, with rugged, snow-clad peaks from 10,000 to 12,000 feet high, and with high, rocky spurs to the east, separating densely-wooded valleys difficult of access and rarely visited. The forests here come down to the western edge of Big Hole valley, and are continuous. The trees are said to be largely *Pinus Murrayana*, but there is probably a considerable proportion of red fir, *Picea Engelmanni* and *Abies subalpina*. The range now takes its turn to the east, forming the northern line of the county, and rises again into some high, snowy peaks, but is much less densely wooded. Where the pass crosses the range from the Big Hole valley to the Bitter Root, the prevalent tree is found to be *Pinus Murrayana*, mixed toward the summit of the divide (at 7,000 feet altitude) with some red fir and a small proportion of *Picea Engelmanni* and *Pinus albicaulis*. The trees are mostly young and small, evidently frequently overrun by fires, a dense new growth immediately in most cases replacing the old. The trunks very rarely reached a diameter of 15 or 20 inches. The timbered area of the county may be estimated at 1,000 square miles. No yellow pine was seen or heard of within its limits.

"DEER LODGE COUNTY (6,500 square miles).—This county, also nearly bisected by the one hundred and thirteenth meridian, is occupied by spurs of the Rocky mountains, which form its southern and eastern border, with the intervening open valleys of Deer Lodge river, Flint creek, and Big Blackfoot river. These spurs are to a large extent wholly bare of trees, only some of the ravines and ridges being covered by a more or less scattered growth of yellow pine and red fir of moderate size, and the higher northern slopes by a denser growth of *Pinus Murrayana*. North of the Big Blackfoot the timber is more dense, coming down into the valley, and consisting principally of

yellow pine, with some red fir and larch, and at the higher elevations (above 5,000 feet) of red fir, larch, and scrub pine. In the higher cañons of the main range to the south it is probable that *Abies subalpina* and *Picea Engelmanni* also occur, as I heard of a soft tamarack found at Gwendale, which appeared from the description to be the latter species. Total timbered area of the county is estimated at 2,250 square miles.

"MISSOULA COUNTY (21,000 square miles).—The Bitter Root mountains, which separate this county from Idaho, are a direct continuation of the Rocky mountains north from the point of divergence of that range in latitude 45° 40′. While broadening out until they cover a base of 100 miles or more, they rarely reach a height of 8,000 feet. There is nothing alpine in the character of their higher vegetation, nor do they anywhere rise above the limit of forest growth. The summits are not often very rugged, and though the slopes may be steep they are not generally greatly broken. For the most part they are well wooded upon both sides, with no meadows along the streams and little grass anywhere until the foot-hills are reached. Upon the Montana side it is from 20 to 40 miles from the base to the summit of the divides, and the Bitter Root valley, which skirts their feet for 60 miles, separates them from the low and comparatively bare spurs of the Rocky mountains on the east.

"Upon crossing the main divide upon the southern border, between the Big Hole and the Bitter Root valleys, at an altitude of 7,000 feet, the yellow pine immediately appears, of large size, and with its usual massive habit, and is henceforth the most conspicuous forest tree along the usual routes of travel, coming farther down into the valleys than any other tree, and more frequently attaining a large size, probably from its less liability to serious injury from fires. The descent from this southern divide to the Bitter Root valley is well wooded with large trees of the yellow pine and red fir (with at first some small *Pinus Murrayana*), which continue to be the only trees seen bordering the valley. These mountains were crossed by me on the Lolo trail up the Lolo creek, and by the Mullan road, which follows the Saint Regis de Borgia river. In the lower cañons only yellow pine and red fir are found, of the usual scattered growth—the trees rarely much over 2 feet in diameter—with larch and *Abies subalpina* coming down the side gulches, and white pine in the middle cañon. The yellow pine gradually gives place to *Picea Engelmanni*, *Abies subalpina*, and *A. grandis*, though none of these reach the size which they attain on the Idaho side of the range. The large timber is mostly confined to the neighborhood of the streams, where the larch and white pine sometimes reach a diameter of 3 or 4 feet, but it becomes much smaller upon the ridges, and in the upper cañons rarely is more than a foot or 18 inches through, while the mountain slopes are usually much burned over and covered with fallen timber, largely of *Pinus Murrayana*. The largest and most abundant tree in the upper cañons is probably the *Picea Engelmanni*. Small trees of the *Thuya gigantea* are also occasional, but nowhere in northern Montana does it become large enough to be of importance. The *Thuya* and *Abies grandis* extend as far south as the Nez Percé creek. I think that no hemlocks were seen on the Montana side of the range, but they may occur.

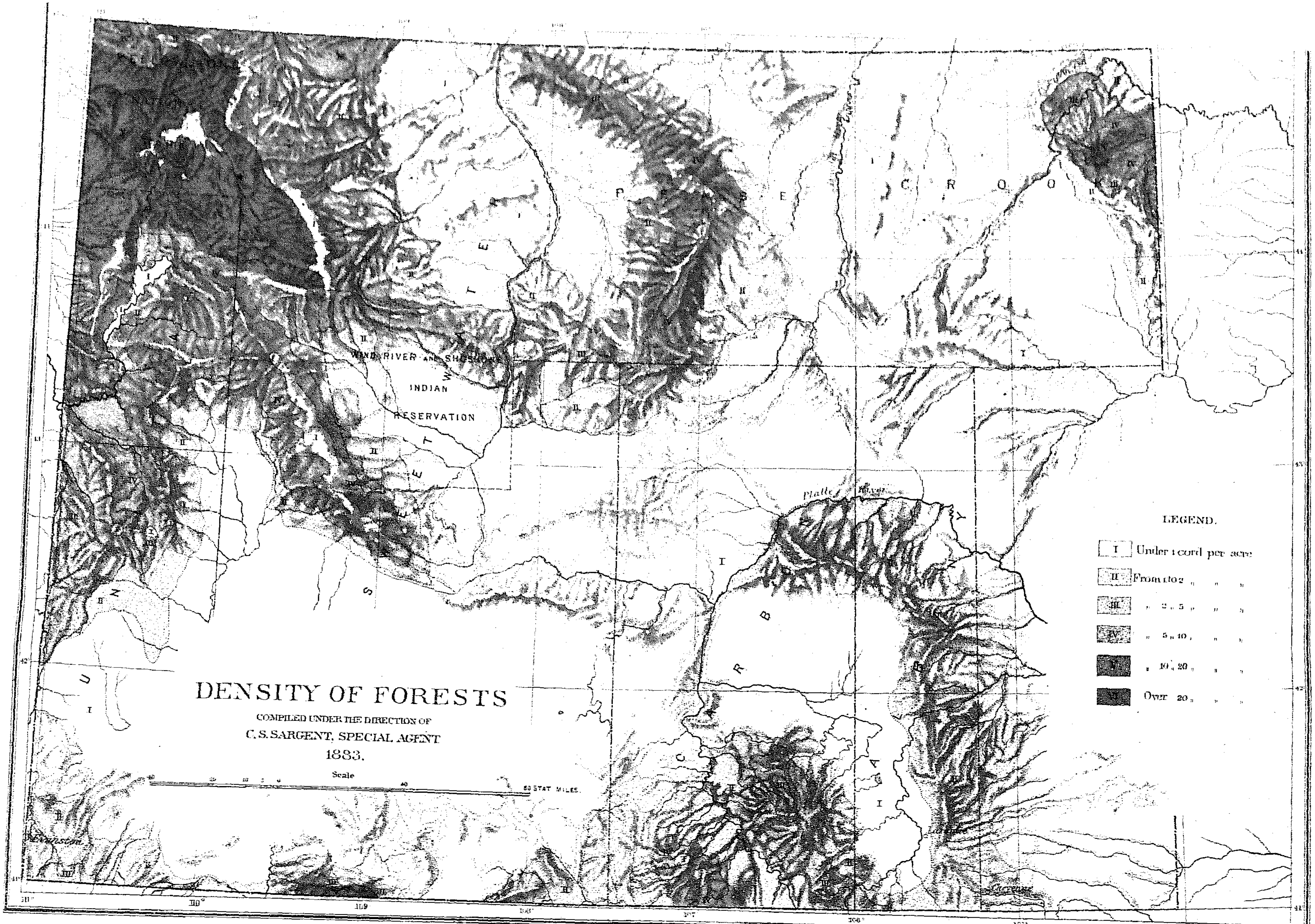
"North of the Mullan road to Clarke's Fork the eastern slopes of the range continue well wooded. On the eastern side of the county the low spur of the Rocky mountains lying to the east of Bitter Root valley is to a large extent bare, but has some young yellow pine (known as 'scrub pine' or 'black-jack pine') and *Pinus Murrayana*. Approaching Hellgate river the timber becomes more prevalent in the ravines; and in the government timber reservation near Missoula, where there is a saw-mill run for government purposes, the timber was found to be yellow pine and red fir (not large) and considerable larch—fine trees 2 feet in diameter or more and 100 feet high. In Granite cañon, in the mountains north of Missoula, where there is also a saw-mill, the lower cañon was occupied by yellow pine and larch, with some red fir rarely over a foot through, and in the upper cañon *Abies subalpina* and *Picea Engelmanni* a foot in diameter. On the mountain sides above the cañon the timber is, as usual, small and worthless for lumber. In the eastern portion of the Flathead Indian reservation a very high and rugged range of mountains extends nearly as far north as the head of Flathead lake, and parallel with the main Rocky Mountain range, which here enters the county and continues across the northern boundary. Both of these ranges are throughout densely wooded, though on the eastern side of the Rocky mountains the timber wholly ceases a few miles (8 or 10) below the summit, giving place to the open grazing region of the upper Missouri. On crossing over the lower end of the western range, from the Big Blackfoot to the Jocko river, the timber was found to be at first almost entirely yellow pine, with red fir and larch in the gulches, the yellow pine ceasing toward the divide (at 5,000 feet altitude) and *Pinus Murrayana* taking its place, but reappearing on the northern side, with occasional *Picea Engelmanni* and even small *Thuya gigantea*. No white pine was seen. The same trees probably continue northward to the boundary (the larch is reported from about 30 miles south of the boundary).

"The remainder of the county, lying west of the Flathead River valley, is wholly occupied by mountains, of less altitude, but, so far as is known, generally densely wooded, with the exception of some of the spurs toward the Flathead river and Clarke's Fork and some small prairies bordering the streams.

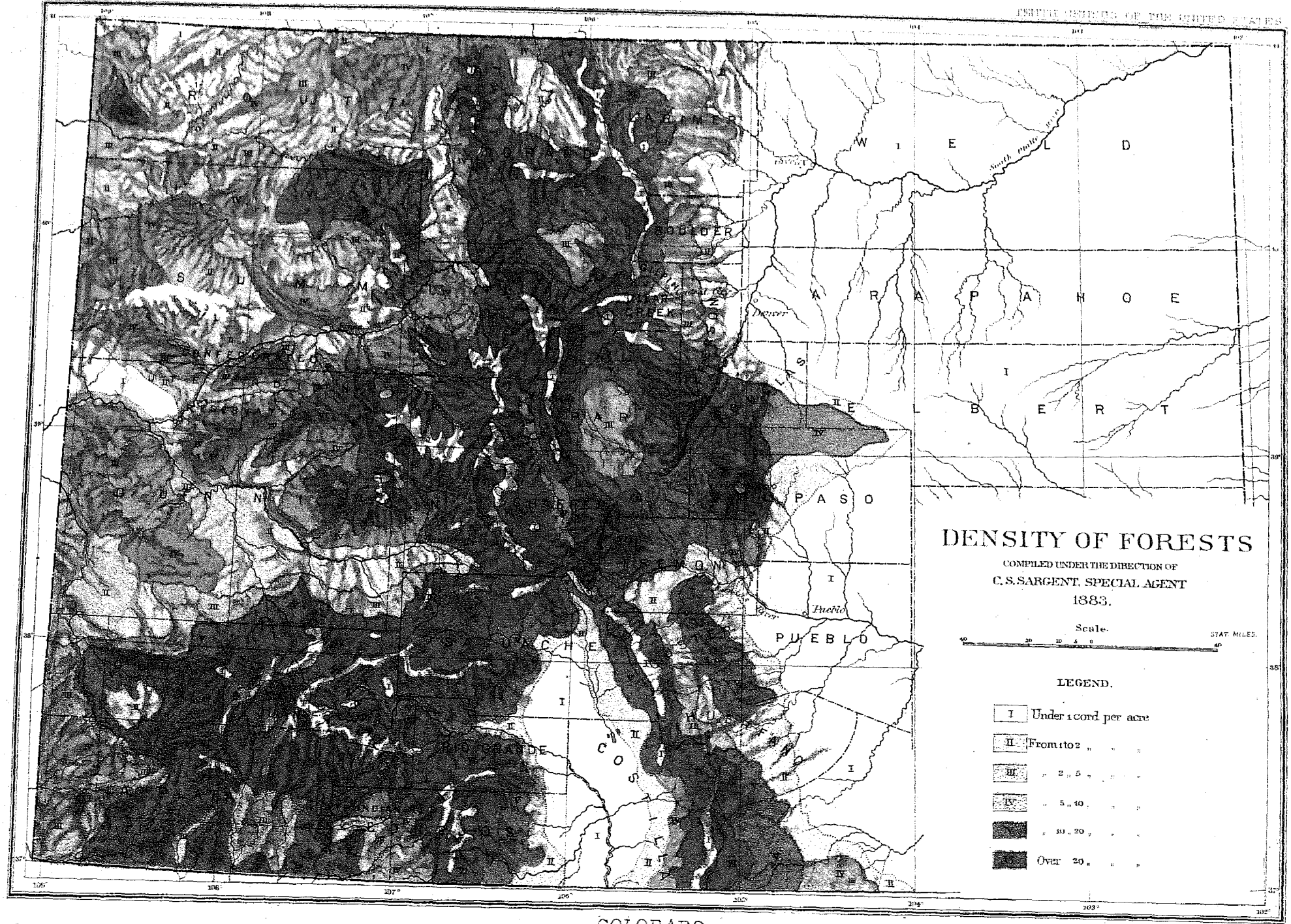
"The total timbered area of the county is estimated at 17,000 square miles."

WYOMING.

The highest mountain ranges in Wyoming only are well timbered. The high rolling table-land which occupies the central part of the territory is destitute of all tree growth, while the low ranges which rise from this plateau


DENSITY OF FORESTS
COMPILED UNDER THE DIRECTION OF
C. S. SARGENT, SPECIAL AGENT
1883.
Scale
60 STAT. MILES.
LEGEND.
I Under 1 cord per acre
II From 1 to 2 " " "
III " 2 " 5 " " "
IV " 5 " 10 " " "
V " 10 " 20 " " "
VI Over 20 " " "
WIND RIVER AND SHOSHONE INDIAN RESERVATION
Platte River
Julius Bien & Co. lith.

WYOMING



COLORADO

Julius Bien & Co lith.

and border it on the south are either treeless or only support a few stunted yellow pines or firs widely scattered or forming small, isolated patches of open forest upon the highest slopes of the most sheltered ravines. The most important forests of the territory are those in the northeastern corner covering the western extension of the Black hills of Dakota, those upon the foot-hills and slopes of the cañons of the Big Horn mountains, and the dense forests of small lodge-pole pine (*Pinus Murrayana*) which occupy all the northwestern portion of the territory studded by the system of mountains surrounding the Yellowstone park.

The most valuable timber of the Big Horn mountains consists of yellow pine (*Pinus ponderosa*), attaining on the foot-hills sufficient size to furnish saw-logs. Probably one-third of this timber on the east side of the mountains has already been cut to supply mills located upon the streams from Crazy Woman creek to Tongue river. The table-land on both sides of the range between the crests of the foot-hills and the base of the Snow range is covered with a belt, from 8 to 10 miles in width, of small white fir (*Abies subalpina*). The trees are small, rarely exceeding 8 or 10 inches in diameter. They afford, however, useful material for fuel and fence and telegraph poles. This forest has suffered seriously from wind storms and fire. A heavy growth of cottonwood, with which is mingled a little green ash, occupies the banks of all the streams of the Big Horn region, with the exception of No-Wood creek, flowing from the western flank.

The forests of the Yellowstone region, composed for the most part of small lodge-pole pine, are confined to the mountain slopes and high valleys, at an elevation of between 5,000 and 10,000 feet. These forests are capable of supplying great quantities of fuel and fencing material. They contain, however, little timber suitable to manufacture into lumber.

The forests of all this arid central region suffer seriously from fire. These increase with the settlement of the country and inflict great damage upon the forest. In northwestern Wyoming, however, the forests of lodge-pole pine (*Pinus Murrayana*) destroyed by fire reproduce themselves, and the area occupied by this species in all the Rocky Mountain region is increasing. This is due no doubt to the fact that fire does not destroy the seeds of this species, protected in the cones, which remain closed upon the trees for years. The heat of the fire causes the cones to open and shed their seeds upon the burned surface of the soil, where they germinate quickly and freely.

During the census year 83,780 acres of woodland were reported destroyed by fire, with an estimated loss of $3,255,000. These fires were set by Indians, trappers, and prospectors.

A little lumber, in addition to that manufactured in the Big Horn region, of which no returns have been received, is sawed in the Medicine Bow and other ranges in the southern part of the territory. A large amount of fire-wood and many railroad ties are cut in the southern mountains and delivered by chutes along the line of the Union Pacific railroad.

COLORADO.

The forests of Colorado are confined to the mountain ranges and high valleys which cover the western half of the state; the elevated, rolling plateau which extends from the eastern base of the mountains to the eastern boundary of the state is entirely destitute of tree growth, with the exception of an occasional stunted willow or cottonwood found in the bottom lands of the large streams. The important forests of the state cover the mountain slopes between 10,000 and 12,500 feet elevation, and are almost exclusively composed of spruce (*Picea Engelmanni*), with which are mingled different alpine pines of little economic value. Below the spruce belt a more open forest of red fir and yellow pine, occupying ravines or scattered over the ridges, extends down to the foot-hills. These are covered with an open growth in which the nut pine and the western juniper are the prevailing trees, while the borders of streams and bottoms of the cañons are occupied by cottonwoods, willows, cherries, oaks, and other deciduous trees and shrubs of little economic importance. Large areas upon the sides of the high Colorado mountains are exclusively covered with a dense growth of the quaking aspen. This tree very generally takes possession here of ground from which the coniferous forest has been removed by fire, and, as the number of forest fires is rapidly increasing in Colorado, it seems destined to become the only widely-distributed forest tree of this region. The high valleys, or "parks" as they are here locally called, when timbered at all, are covered with a dense forest growth in which the lodge-pole pine (*Pinus Murrayana*), also common at high elevations in the spruce forests, is the prevailing and often the only species, disputing with the aspen the possession of the burned soil. The high plateau of southwestern Colorado is either treeless or is thinly covered with an open growth of small, stunted junipers.

The increase in the number of forest fires raging in the mountains of Colorado is alarming in a region where the forest once destroyed cannot easily reproduce itself, and upon mountains where forest covering is necessary to preserve the integrity of the channels and the constant flow of numerous important streams essential to the irrigation of wide areas of arid territory.

During the census year 113,820 acres of forest were reported destroyed by fire, with an estimated loss of $935,500. These fires were set by careless hunters, miners, and prospectors, and by Indians or whites through malice.

The forests of the Colorado foot-hills afford abundant fuel and fencing material to supply the wants of the present population of this part of the state. Coarse lumber, suitable for the timbering of mines and railroad

construction, is manufactured from the fir and pines of the lower mountain slopes, which have also furnished immense quantities of fuel and railway ties. The timber, however, of this forest most accessible to mining centers and the lines of railroads has already been destroyed, while its productive capacity is everywhere impaired by wasteful methods of lumbering and destructive conflagrations. The elevated spruce forests, which contain the only great bodies of heavy timber found in the central Rocky Mountain region, have thus far, on account of the difficulties of operating in them, escaped all serious inroads from the ax of the lumberman. Small portable mills, however, have been established in these forests to supply the wants of some of the most elevated mining centers, and fires every year reduce their extent and value.

Colorado is principally supplied with lumber from Chicago; a small amount is manufactured, however, in the state, mostly upon the waters of the South Fork of the Platte river, in Jefferson county, and in the extensive pineries which cover the divide between the waters of the South Platte and the Arkansas rivers. A little lumber is also manufactured in small portable mills in nearly every county.

NEW MEXICO.

The forests of New Mexico are confined to the slopes and cañons of the high mountain ranges. The elevated plateau which occupies the whole of the eastern part of the territory is treeless, with the exception of occasional willows and cottonwoods bordering the large streams, while the high *mesas* of the southwest and west are sometimes dotted with an open growth of dwarf junipers and nut pines of considerable local importance as a source of fuel and fencing supply. The high mountain ranges extending southward into the northern part of the territory are covered with forests very similar in composition, density, and distribution to those covering the mountains of Colorado. Engelmann's spruce is here the important timber tree at high elevations; lower, open forests of red fir and yellow pine occupy the sides of cañons and the lower mountain slopes, and the nut pine and juniper cover the foot-hills with an open, scattered growth. The detached mountain ranges which spring from the central plateau of the territory are less heavily timbered than the higher mountains north and south. The yellow pine is here the most common and important tree, mingled in sheltered cañons and at highest elevations with occasional red firs.

The most important forests of the territory cover the high group of mountain ranges west of the Rio Grande and south of the thirty-fourth degree of latitude—the San Francisco, the Tulerosa, Sierra Blanca, Sierra Diablo, Mogollon, Pinos Altos, and Mimbres. The foot-hills and lower slopes of these mountains, between 5,000 and 7,000 feet elevation, are covered with a heavy growth of junipers, nut pines, and different evergreen oaks. The banks of streams are here lined with immense cottonwoods, sycamores, cherries, ashes, and hackberries, while the *arroyos* or depressions in the *mesas* contain fine groves of mesquit. Above an elevation of 7,000 feet the yellow pine appears, and mingled with it on north slopes the red fir and white pine (*Pinus reflexa*); the elevated valleys contain fine groves of cottonwood, box-elder, alder, and small oaks, while the most inaccessible slopes of some of the highest ranges are covered with forests of cypress (*Cupressus Guadalupensis*).

The coniferous forests of these mountains are dense and valuable, and, although not yet accessible for lumbering operations except at a few points, they seem destined to become an important factor in the future development of the whole region. They can, if properly protected, supply with lumber indefinitely a larger population than will probably occupy this part of the United States.

The deciduous trees of this entire southwestern region, often of considerable size, are generally hollow, especially the oaks; they are of little value for any mechanical purpose, although affording abundant and excellent fuel.

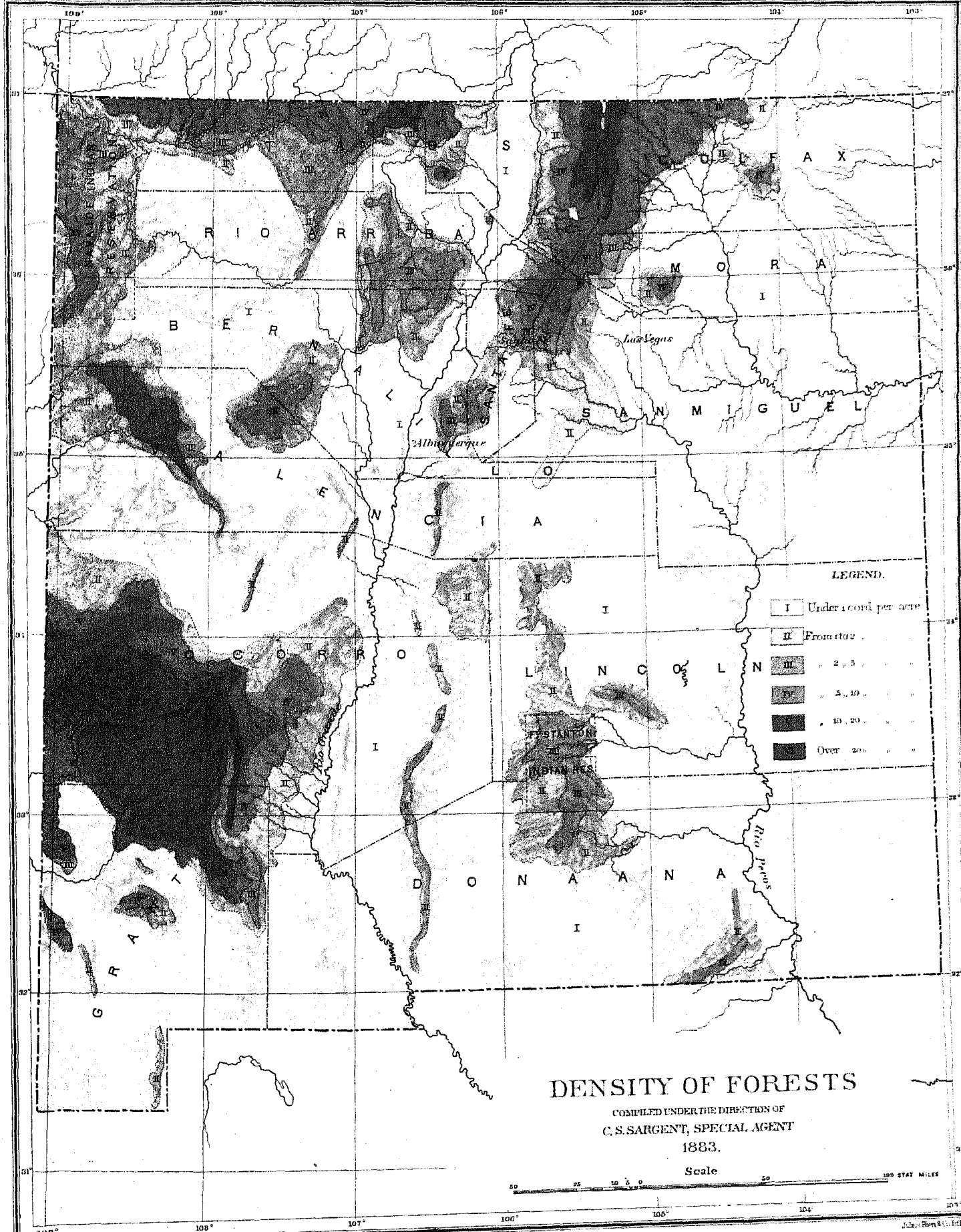
During the census year 64,034 acres of woodland only were reported destroyed by fire, with an estimated loss of $142,075.

A small amount of coarse lumber, principally yellow pine, is manufactured in the territory, mostly in the counties of San Miguel and Santa Fé. New Mexico, however, like Colorado, obtains most of its lumber by rail from Chicago.

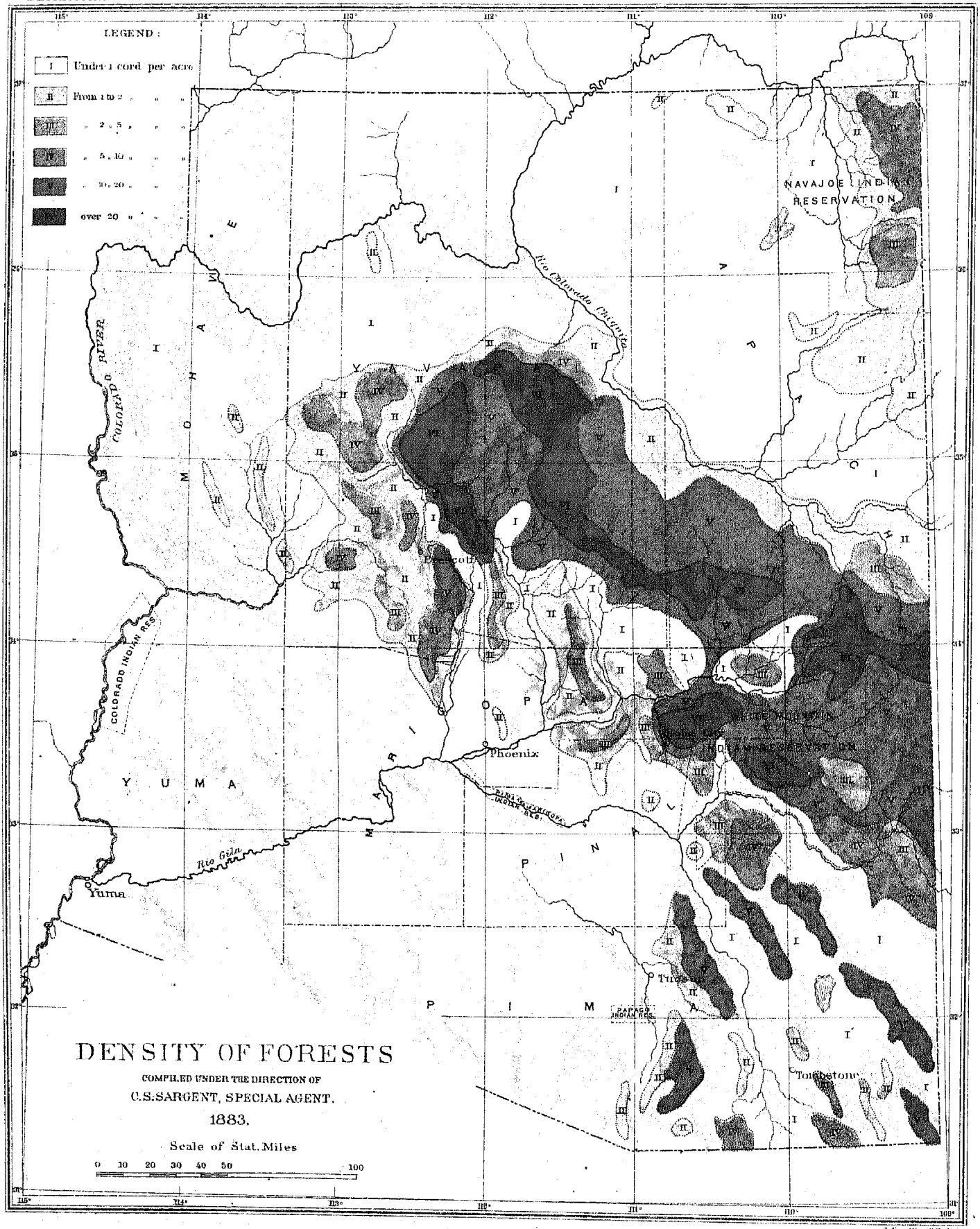
ARIZONA.

Northern, western, and southwestern Arizona are destitute of true forests. Ravines in the *mesas* of the high Colorado plateau of northern Arizona are occasionally covered, however, with stunted junipers. Cottonwoods and willows line the banks of the Colorado river, and the ironwood, the palo verde, the mesquit, the suwarrow, and other Mexican forms of arborescent vegetation are found in the valley of the Gila and the deserts of the southern part of the territory; individual trees are, however, widely scattered, nowhere forming forests in the true meaning of the word. The low lava ridges and arid lake beds with which the southwestern part of the territory is covered are entirely destitute of tree growth.

The mountain system culminating south of the Colorado plateau in the San Francisco mountains, and extending southeasterly through the middle of the territory into New Mexico, is well timbered. The high ranges which spring from this central elevated plateau bear heavy forests of yellow pine and red fir, the plateau itself


RIO ARRIBA
TAOS
COLFAX
MORA
SAN MIGUEL
BERNALILLO
VALENCIA
SOCORRO
LINCOLN
DONA ANA
GRANT
Albuquerque
Las Vegas
Santa Fe
Rio Grande
Rio Pecos
FT STANTON
INDIAN RES.
LEGEND.
I Under 1 cord per acre
II From 1 to 2 "
III " 2 " 5 "
IV " 5 " 10 "
" 10 " 20 "
Over 20 "
DENSITY OF FORESTS
COMPILED UNDER THE DIRECTION OF
C. S. SARGENT, SPECIAL AGENT
1883.
Scale
100 STAT MILES

NEW MEXICO



ARIZONA

Julius Bien & Co. lith.

being covered, over thousands of square miles, with an open growth of yellow pine of considerable size. The streams and bottoms of the high mountains are lined with deciduous trees, of which the cottonwood, the cherry, the ash, the alder, and the walnut are the largest and most important. The group of short, detached mountain ranges which occupies with a general north and south trend the southeastern part of the territory is covered with a rich and varied forest growth. The highest slopes are covered with forests of pine, in which, in the Santa Catalina range at least, great bodies of splendid cypress (*Cupressus Guadalupensis*) are found; a little lower the red fir and white pine (*Pinus reflexa*), different oaks and junipers with a madroña, are scattered over the dry, gravelly slopes and ridges between 5,000 and 7,000 feet elevation. These in turn are replaced below 5,000 feet with an open growth of small evergreen oaks. The bottoms of the cañons and the borders of the streams between 4,000 and 8,000 feet elevation are lined in these mountains with hackberry, sycamore, cottonwood, willows, cherries, and ashes. The *arroyos* in the *mesas* are often covered, as in southern New Mexico, with noble groves of mesquit, or in drier situations support a stunted growth of acacias, yuccas, cacti, and other desert plants.

The yellow pine is the only tree of Arizona of great importance as a source of lumber supply. Oaks and other hard-wood trees are invariably defective and of little value except for fuel. The red fir, white pine, and cypress occur only at high elevations, and are generally too scattered and too difficult of access to make their manufacture into lumber practicable for the present at least.

The pine forests of central Arizona and southwestern New Mexico are of great importance to the development of the treeless regions which surround them. No other body of timber of any extent or value exists near the southern boundary of the United States between the pine belt of eastern Texas and the forests of the California mountains. These southern interior forests have nowhere yet greatly suffered. Their inaccessibility has protected them. Railroads, however, now either penetrate this forest region, or will soon do so, and these, with the rapid development of the mining industry now going on in the southwest, threaten these forests with the dangers which are fast exterminating those of Colorado and Utah.

During the census year 10,240 acres of woodland were destroyed by fire, with an estimated loss of $56,000. These fires were set by careless hunters, prospectors, and Indians.

Pine lumber is sawed in Pima and Pinal counties, principally upon the Santa Catalina, Santa Rita, and Huachuca mountains, to supply important mining centers in this part of the territory. It is also manufactured in small quantities in portable mills near Indian reservations and other centers of population throughout the forest region. Returns from 13 mills only, situated in Pima, Pinal, Apache, and Yavapai counties, have been received. Southern Arizona is now, in spite of its fine forests of pine, almost entirely supplied by rail with lumber manufactured in California.

UTAH.

The Uintah range, occupying with an east and west trend the whole of the northeastern part of the territory, the Wahsatch mountains and their southern extension, the San Pitch and the Sanpete ranges, extending north and south nearly through the center of the territory, and the mountains which bound on the east the great Colorado plateau, bear at high elevations fir, spruce, and pine forests of considerable extent. The foot-hills of these mountains and their high valleys are dotted with an open growth of nut pine, juniper, and mountain mahogany (*Cercocarpus*). The high Colorado plateau and the arid deserts of western and southern Utah are treeless, with the exception of a few stunted junipers and nut pines which struggle for existence upon some of the low mountain ranges, and of willows and cottonwoods which line the banks of the infrequent and scanty streams.

The western flank of the Wahsatch mountains north of the fortieth degree of latitude has already been almost denuded of its best timber to supply the wants of the agricultural and mining settlements of the Salt Lake region, and the scanty forests of the territory have everywhere suffered serious loss from fire and wasteful methods of cutting timber and railway ties and of manufacturing charcoal.

During the census year 42,865 acres of woodland were reported destroyed by fire, with an estimated loss of $1,042,800. These fires were set by Indians, wood-cutters, careless hunters, and prospectors.

Small quantities of lumber—pine, cottonwood, and a little spruce—are manufactured through the Wahsatch region, the principal centers of manufacture being Beaver City and Cedar City, in the south, the neighborhood of Salt Lake City, and Cache county in the extreme northern part of the territory. Utah is, however, almost entirely supplied with lumber from the eastern slopes of the California sierras and from Chicago. Small tanneries in Salt Lake City obtain a supply of red fir and spruce bark from the neighboring mountains.

The following notes upon Utah forests, made during the prosecution of a special investigation into the meat-producing capacity of the territory, have been supplied by Mr. E. C. Hall, a special agent of the Census, in the division of "Meat Production in the Grazing States and Territories":

"The timber of the Wahsatch mountains, in Cache, Rich, Morgan, and Weber counties of Utah, hardly suffices for the wants of the settlers. The trees from which lumber is obtained are cedar and a variety of white pine (*Pinus flexilis*). Some fir (*Pseudotsuga Douglasii*) is found, but it is not common north of the latitude of Salt Lake City. This tree likewise furnishes an inferior kind of lumber. In general, in Utah, north of latitude 40°, the west

base of the Wahsatch mountains has been stripped of the available timber, so that in the accessible cañons, especially in the neighborhood of settlements, it is laborious and expensive obtaining posts and poles for fencing, to say nothing of smooth planks, etc., for building. Cottonwood and occasionally box-elder are found fringing the river bottoms of the sections described.

"The Oquirrh mountains, on the east of Tooele county, and the Onaqui mountains, 30 miles west, contain cedar and considerable red fir, the latter a tree which I am told is not frequent in the Wahsatch range. The mining camps of Salt Lake and Tooele counties have largely depleted the timber areas of these mountains. More timber is standing on the Onaqui hills than on the Oquirrh range. From the vicinity of the latter to Cottonwood and Bingham Cañon mining districts the dearth of good fencing material is very noticeable throughout Box Elder, Cache, Rich, Weber, Morgan, and Salt Lake counties. Willow withes, stone walls, cottonwood poles, and sod walls flanked by ditches are among the devices for barriers against stock incursion, all pointing to the lack and costliness of lumber.

"LAKE RANGE, WEST OF UTAH LAKE.—This range of low mountains contains scattered black balsam and red fir. In winter this range is visited from the settlements of Utah valley, and the trees felled and sledded across the lake on the ice, to be used by the railroad and by farmers. No piñon pine was found in the Oquirrh or Onaqui mountains.

"The San Pitch mountains, in latitude 39° 30′, longitude 111° 52′, contain sparse timber—a so-called white pine (*Pinus flexilis*), scrubby cedar, and some other evergreen trees—at a high elevation and unavailable as lumber. No good clear planking suitable for building is obtained from these cuts.

"The low ranges west of Juab valley and flanking Dog valley, Dry valley, and Ferner valley, in latitude 39° 30′, longitude 112°, contain straggling cedar and some red fir difficult of access. The timber of the whole region north of latitude 39° and west of the main Wahsatch mountains is meager and inadequate for the purposes of the Mormon settlers.

"Fencing about Salt Lake City is of poor construction and costs $200 per mile of pine poles and cedar posts. I saw some posts of white balsam (*Abies concolor*) 50 feet long, obtained from the cañons of the San Pitch range, used for fencing. At Springville, in Utah valley, posts of cedar were pointed out which were in good condition after fourteen years standing. Were it not for the existence of the 'no-fence' law, which enables a farmer to cultivate unfenced ground and claim damages from incursions of stock, the Utah farmer would be very badly off, not having means to purchase fencing material in a country so ill supplied with timber. The cedar which abounds here affords a lasting supply of fire-wood and posts, but for poles or plank the region depends largely upon imported lumber, especially for building plank, joists, etc.

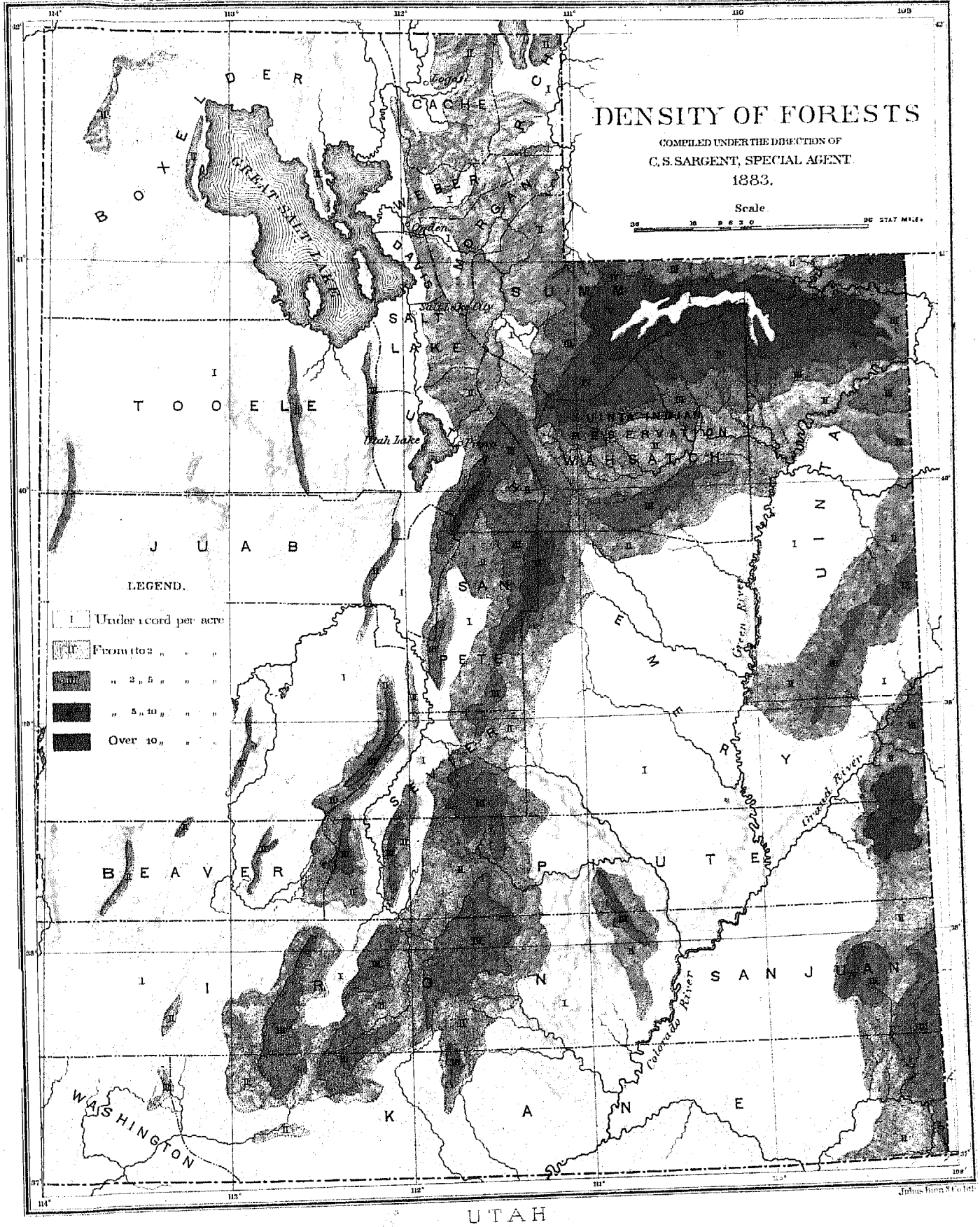
"Upon ranges flanking East and West Tintic valleys, Juab county, in latitude 39° 50′, longitude 112° 30′, the timber is not abundant; it consists of red fir and black and white balsam, from which rough lumber for the mining camps of Mammoth, Tintic, and Silver City has been extensively taken. Cedar of the usual dwarfed kind grows abundantly along the upper slopes of the foot-hills, and is used for braces and posts in shafts of mines.

"SANPETE VALLEY RANGE (longitude 111° 30′, latitude 39° 20′).—The Wahsatch mountains, on the east of Sanpete valley, carry on their spurs and through the deep cañons facing the valley some of the best timber found in Utah. It is largely used by the Sanpete settlers. Yellow pine, black and white balsam, red fir, cedar, and poplar constitute the varieties of trees found. The yellow pine, less abundant now in accessible cañons, furnishes, it is claimed, a clear and firm lumber, fit for building, and not surpassed by any variety in Utah. The range west of the Sanpete mountains—*i. e.*, the San Pitch mountains before spoken of—carries on its eastern slopes and cañons considerable balsam of both varieties and some red fir and poplar about the headwaters of creeks. Little yellow pine is found on the San Pitch range; at least, none is taken out at present, although I was told considerable had already been lumbered from such cañons as were penetrable. Fencing of cedar posts and poplar and balsam poles is largely used in the valley; cedar posts and pine plank are also used in fencing meadows and fields. In no other valley of Utah are the Mormons so well supplied, apparently, with fair lumber of native growth. Except for furniture and house trimmings, no imported wood is used here.

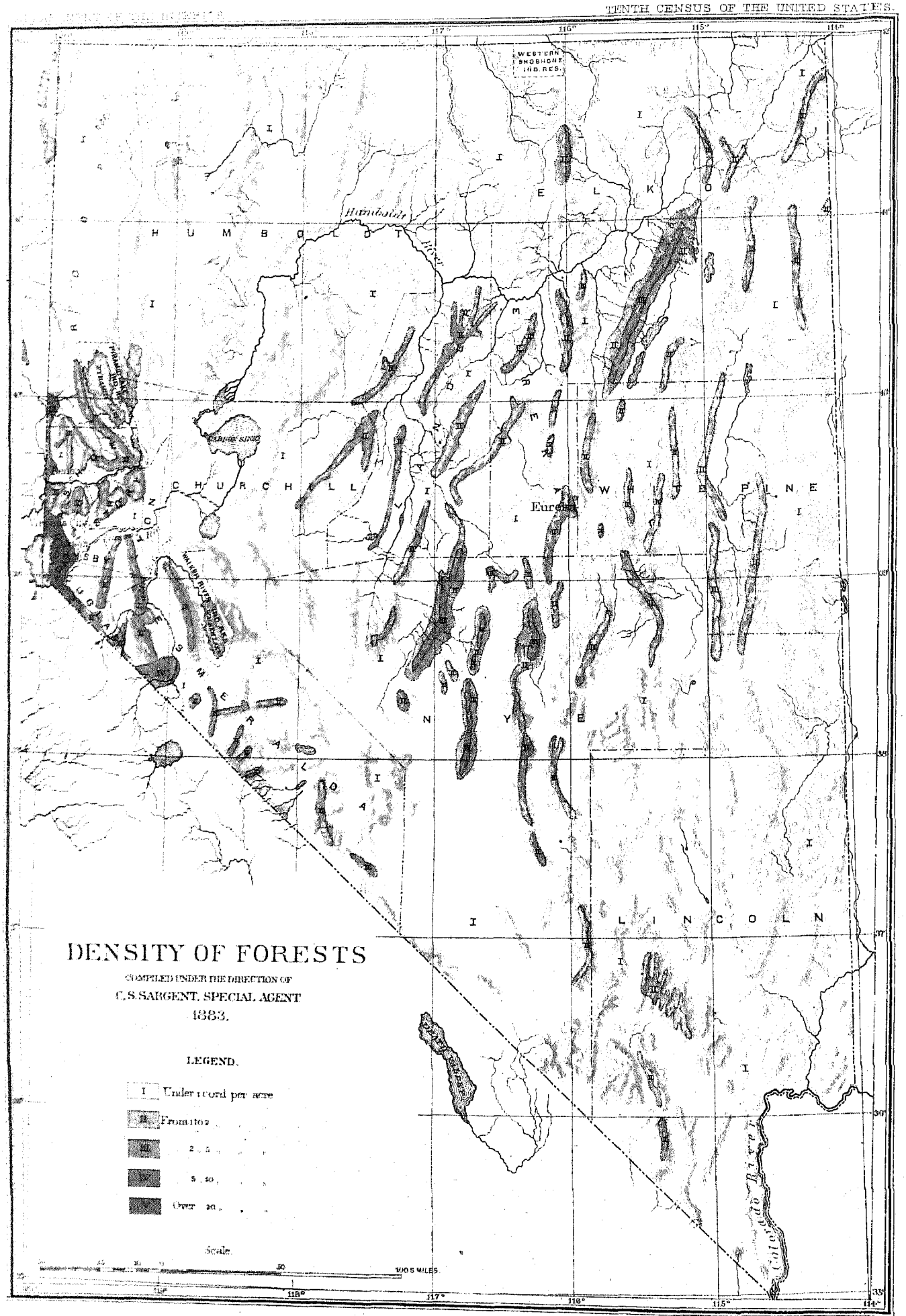
"SEVIER RIVER MOUNTAINS (latitude 38° 30′ to 39° 10′, longitude 112°).—The Tushar mountains and the Valley range, on the west of the Sevier valley, are supplied with meager timber, especially the Valley range. In no part of Utah have I noticed so few and so limited areas inclosed. Timber is said to exist in inaccessible places only on the Wahsatch range to the east of the valley. This is true in regard to the ranges west of the Sevier valley, where the character of the tree growth is inferior to even the average poor quality of Utah forests. Black balsam, white balsam and red fir grow in both ranges, but are approached with great difficulty. The indigenous scrub cedar prevails often in thick groves along the foot-hills, especially on the Valley and Tushar ranges to the west of the valley. Several saw-mills at the mouths of cañon streams on the East Wahsatch range have for several years worked up all the available lumber, but the prices asked for lumber—from $35 to $45 per 1,000 feet—place fencing material beyond the reach of the Sevier farmer.

"All the way up the Sevier valley, and along its south and east forks, fencing is limited and lumber high, a sure proof of the inadequate supply of trees on accessible mountains.

"Fish Lake plateau and mountains (latitude 38° 33′, longitude 111° 50′) contain a considerable quantity of the prevailing timber of Utah, as do also Thousand Springs mountains.


DENSITY OF FORESTS
COMPILED UNDER THE DIRECTION OF
C. S. SARGENT, SPECIAL AGENT
1883.
Scale
LEGEND.
I Under 1 cord per acre
II From 1 to 2 " " "
III " 2 " 5 " " "
" 5 " 10 " " "
Over 10 " " "
BOX ELDER
CACHE
WEBER
DAVIS
SALT LAKE
TOOELE
UTAH
SUMMIT
WASATCH
UINTA RESERVATION
UINTAH
JUAB
SANPETE
EMERY
GRAND
SAN JUAN
PIUTE
BEAVER
IRON
WASHINGTON
KANE
Great Salt Lake
Ogden
Salt Lake City
Utah Lake
Provo
Green River
Grand River
Colorado River
Julius Bien & Co. lith.

UTAH



DENSITY OF FORESTS

COMPILED UNDER THE DIRECTION OF

C. S. SARGENT, SPECIAL AGENT

1883.

LEGEND.

I. Under 1 cord per acre

II. From 1 to 2 " "

III. 2 - 5 " "

IV. 5 - 10 " "

V. Over 10 " "

Julius Bien & Co. lith.

NEVADA

"The Aquarius plateau is said by Sevier Valley stockmen to be abundantly timbered with pine, balsam, and spruce, but Boulder valley (latitude 37° 55′, longitude 110° 30′) was destitute of standing timber, save cedar and poplar on its foot-hill fringe. The country was visited by fires, the Mormons told me, in 1872–'73, which destroyed large areas of the forests in the region southeast of the Grass Valley country. The whole section of Utah lying east of the Sevier valley to the Rio Colorado is better timbered, but from its rough and impenetrable location the timber is of no avail to most of the settlers, but only to such as penetrate the high valleys of Grass, Boulder, Potato, etc., lying adjacent to the timber. Fencing on Grass and Rabbit valleys, western Pinto county, is cheaper than in Sevier valley, but farmers and stockmen are so poor that they are forced to avail themselves of the no-fence law when breaking ground for crops.

"In the Paria River region fencing is very limited and lumber expensive, as timber is hard to get out of the mountain cañons.

"In the Kanab River region fencing at the settlements of Upper Kanab and Lower Kanab, Kane county, is said to be expensive, as material is difficult to obtain, the cañons leading to the valley affording a meager supply of cedar and black and white balsam, while some red fir and yellow pine is said to grow on the Sevier plateau (latitude 37° 30′); this, however, seldom reaches a market in the settlements, owing to the isolated situation of these forests.

"Considerable scrub oak is found on the slopes of the Oquirrh and Onaqui mountains, above referred to, in Tooele county, and many cedar thickets of considerable extent. In Tooele valley some fencing with cedar and panels of balsam occurs. Rush valley contains some bull fences of trunks of cedar, costing $1 25 per rod, showing the cost of even poor material.

"It will be observed that outside of the Wahsatch mountains no building timber of value has been noted in Utah. The supply in this range has been largely consumed from the easily-approached cañons and slopes.

"In summing up my observations, which were made wholly with a view of investigating the fencing of pasture areas and cost of same, it may be stated that Utah seemed very generally lacking in serviceable material for fencing or building. The country settled for thirty years has drawn upon the near supply of standing timber, so that now lumber is obtained by great exertion and expense in most of the valley settlements. The labor and cost of fencing caused Brigham Young to enact the no-fence law, which enabled the destitute settlers to break ground, irrigate, and raise grain without the provision of any barrier against stock inroads, the cattleman being held responsible for the damages of his herd. This law in itself is a commentary on the scarcity of timber in Utah."

NEVADA.

The tree growth of Nevada, except in a portion of Douglas county, in the extreme western part of the state, which the forests of the California sierras just reach, is confined to the low ridges of the central and southern part of the state. The most important of these—the Humboldt, Toiyabe, Monitor Creek, Timpiute, Hot Creek, Kawich, and probably others—bear near their summits, in sheltered ravines, scattered patches of stunted white pine (*Pinus flexilis*) of sufficient size to furnish saw-logs. The lower slopes of the mountains of this region are often quite thickly covered with small nut-pines and groves of the mountain mahogany (*Cercocarpus*), here attaining its greatest development. Below the nut-pine low, stunted junipers cover the foot-hills, often extending, in the central part of the state, across the narrow elevated valleys which separate the low mountain ranges.

The great development of the mining interests of Nevada has already nearly exterminated its scanty and stunted forests. The white pine has been cut in the neighborhood of mines from all the mountain ranges, and the most accessible nut-pine, juniper, and mountain mahogany have been converted into cord-wood or made into charcoal. The forests of Nevada are nowhere reproducing themselves, and a scarcity of fuel, even for domestic purposes, must soon be felt.

A considerable amount of lumber is manufactured in the neighborhood of lake Tahoe, in Douglas county, and sent in flumes down the eastern slopes of the sierras to supply Carson City and Virginia City. The lumber-manufacturing interests of the remainder of the state are necessarily small and unimportant. Their entire extermination, with the forests which furnish them material, cannot be long delayed.

During the census year 8,710 acres of woodland were devastated by fire, with a loss of $19,000. The fires were traced to hunters and Indians.

IDAHO.

The western slopes of the Bitter Root and Cœur d'Alêne mountains, which form north of latitude 46° the eastern boundary of the territory of Idaho, are covered with dense, extensive, and valuable forests of fir, pine, and larch. The ridges of the Rocky mountains, which below latitude 46° occupy the eastern border of the territory, and the extreme eastern development of the Blue mountains of Oregon, just entering it from the west, are less heavily timbered with a scattered growth, in which yellow pine and red fir are still the prevailing trees. The great central region occupied by the Salmon River mountains is unexplored. These mountains are more or less timbered, but nothing is known of the composition or character of the forests which cover them. Judging, however, from the general elevation and climate of this region, its forests cannot be very important, nor capable of

supplying more than the local wants of its mining population. The great plains south and southeast of the Salmon River mountains, comprising fully one-third of the territory, are entirely destitute of tree covering, while the Snake River range and the ranges of the Bear River country contain in their more sheltered cañons only small areas of open, stunted forest.

During the census year 21,000 acres of woodland were reported destroyed by fire, with an estimated loss of $202,000. These fires originated in the carelessness of hunters, prospectors, Indians, etc.

A small amount of pine and fir lumber is manufactured at Boisé City and near other centers of population. The great forests of cedar, fir, and pine, however, in the Cœur d'Alêne region are still almost intact. These forests, with proper care, are capable of furnishing indefinitely the treeless agricultural region of eastern Washington territory and Oregon with an abundant supply of excellent building material.

The following extracts are made from Mr. Sereno Watson's report upon the forests of the territory:

"This territory north of latitude 44½° is occupied by the Rocky and the Bitter Root mountains, forming its eastern boundary, with their broad, timbered, interlacing spurs, which terminate in the high, mostly treeless plateau which extends from near the Spokane river in a southeasterly direction to this parallel of latitude. The southern and southwestern portions were not visited by me, and the statements regarding them are to some extent conjectural.

"LEMHI COUNTY (5,530 square miles).—In the extreme eastern portion of this county, where the mountains are crossed by the Utah and Northern railroad, scattered trees of red fir are first met at an altitude of 6,000 feet. Beaver cañon, up which the railroad passes, is well timbered on both sides nearly to its head at 6,600 feet altitude with red fir only, but the broad plateau at the summit (6,869 feet) is treeless. In the lateral cañons (8 to 10 miles long), coming out near the mouth of Beaver cañon, there are two saw-mills, one of which was visited. The timber was here found to be confined to the south side of the cañon, and consisted almost wholly of red fir (here called 'red pine'), averaging from 20 to 22 inches in diameter. The largest log seen measured 32 inches at the butt. A 'white pine' proved to be *Picea Engelmanni*, and a 'bird's-eye pine' was *Pinus Murrayana*, both small, as was also the balsam (*Abies subalpina*), which was found some 3 or 4 miles up the cañon. The yellow pine did not occur here.

"It is probable that the cañons westward along the range are similarly timbered as far as the Lemhi agency. Here the character of the range changes (as stated under Beaver Head county, Montana), becoming higher and more rugged, and the *Pinus Murrayana* is probably more abundant, at least at the higher altitudes. The yellow pine also appears, but at what point is uncertain; it is certainly found at Gibbonsville, on the North Fork of the Salmon river, and it probably extends still farther southward. The Salmon River mountains, lying between the Lemhi river and Rock creek, are reported to be well timbered. The southwestern portion of the county I presume to be much more open.

"The total timbered area is estimated at from 1,500 to 2,000 square miles.

"IDAHO COUNTY (10,100 square miles).—The high and crowded spurs of the Bitter Root mountains fill the entire northeastern portion of this county, extending to the line of the South Fork of the Clearwater, mostly densely wooded from base to summit. The foot-hills and plateaus between the streams are more or less covered with scattered yellow pine and red fir. The valley of the Salmon river is probably comparatively treeless, and the low mountain range between that river and the Snake is scantily timbered.

"Estimated timber area, 4,000 square miles.

"WASHINGTON COUNTY (3,000 square miles).—I have but little information in regard to this county. The southern portion has been surveyed, and is probably nearly treeless. The rest appears to be more mountainous, and may be scantily timbered.

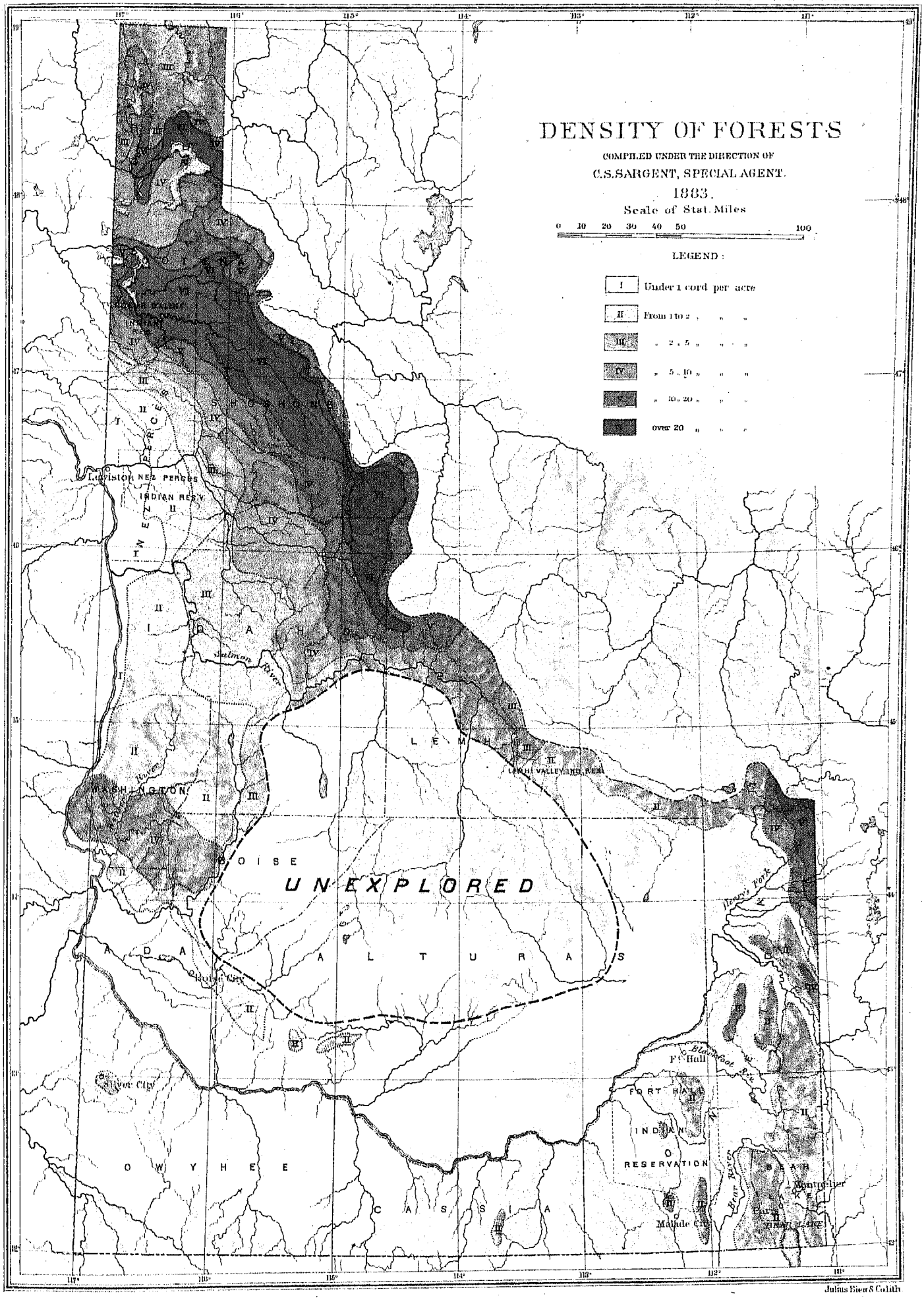
"Wooded area (say) 300 square miles.

"NEZ PERCÉ COUNTY (3,400 square miles).—Mainly high plateau, at about 3,000 feet altitude, in the southeast more or less covered with scattered yellow pine and red fir of good size, on the western side nearly without timber or with occasional yellow pine. Toward the head of Potluck creek some yellow pine and red fir are found in the valleys, and in the northeast the spurs from the Rocky mountains enter the county, covered in addition with the larch and *Thuya gigantea*. East of the Indian reservation the county extends up into the mountains in the form of a narrow gore, and is heavily timbered. The portion lying south of the reservation in the angle between the Snake and Salmon rivers is occupied by low mountains, mostly bare.

"Total timbered area estimated at 750 square miles.

"SHOSHONE COUNTY (5,950 square miles).—Wholly mountainous and covered with forests, with the exception of some prairies and open country near the Clearwater and lower portion of the Lolo Fork.

"Immediately after crossing the divide by the Lolo trail from Montana, at an altitude of 6,000 feet, the forest consisted of *Abies subalpina* and *Picea Engelmanni*, with young *Abies grandis* and *Tsuga Mertensiana*, and occasional larch and red fir, and upon the creeks some small *Thuya* and *Taxus*. The trail soon ascended the ridges and followed them for about 100 miles at an altitude of from 5,000 to over 7,000 feet, doubtless to avoid the fallen timber which made the cañons impassable, though enough of it was found on the route followed. The timber on these ridges was often small and scattered—*Abies subalpina* and *Picea Engelmanni*, with *Pinus Murrayana* and *P. albicaulis*—or on the damper northern slopes with larch and red fir, balsam, hemlock, and sometimes the mountain


DENSITY OF FORESTS
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1883.
Scale of Stat. Miles
0 10 20 30 40 50 100
LEGEND:
I Under 1 cord per acre
II From 1 to 2 " " "
III " 2 " 5 " " "
IV " 5 " 10 " " "
V " 10 " 20 " " "
VI over 20 " " "
UNEXPLORED
IDAHO
WASHINGTON
OWYHEE
BOISE
ALTURAS
CASSIA
BEAR
FORT HALL INDIAN RESERVATION
LEMHI
LEMHI VALLEY IND. RES.
LAPWAI VALLEY IND. RES.
LEWISTON NEZ PERCES INDIAN RES.V
Salmon River
Boise City
Silver City
Malade City
Ft Hall
Montpelier
Paris
Bear River
Julius Bien & Co lith.

hemlock (*Tsuga Pattoniana*), the trees larger (occasionally 2 feet through, the *Abies grandis* being the largest). The white pine (*Pinus monticola*) also frequently occurred. During the last day upon this ridge the trail was through heavy timber, chiefly of hemlock sometimes 3 feet in diameter, with some *Abies* and rarely *Pinus Murrayana* and *P. monticola*, the ridge even at 7,000 feet being covered with the same dense growth. Descending quite abruptly from the drier extremity of the spur, which was covered with *Abies*, *Tsuga*, and *Pinus* (*Murrayana*, *albicaulis*, and *monticola*), we passed through a forest of heavy balsam (*Abies grandis*), with a few larch and some red fir, and at about 4,000 feet came upon cedar (*Thuya gigantea*) to the exclusion of everything else—the trees from 2 to 4 feet in diameter. On the stream banks at the base were found the *Thuya*, *Pinus monticola*, *Abies subalpina* and *A. grandis*, *Picea Engelmanni*, and *Tsuga Mertensiana*, all growing together, with an undergrowth of maple, mountain ash, *Vaccinium*, *Ceanothus*, *Cratægus*, *Pachystima*, *Prunus*, etc. With timber of this character upon the high ridges it is evident that there must be much very heavy timber in the cañons.

"After crossing a low ridge covered with cedar, larch, and red fir, and following a narrow meadow frequently interrupted by clumps of timber, the trail at length came out upon an open *camass* prairie 25 miles northeast of Kamai. From this point the timber covering the plateau is an open growth of yellow pine and red fir, often quite large, with young trees intermixed, and some *Picea Engelmanni* and the two *Abies* in the wetter places. Considerable timber is cut upon the Lolo Fork and Clearwater and floated down to the mills at Lewiston. It is uncertain how far south along the main range the above large variety of trees continues. It is probable, in my opinion, that the *Thuya*, *Abies grandis*, *Tsuga*, *Pinus monticola*, and *Taxus* do not pass beyond the headwaters of the Clearwater, or, at the farthest, that some of them may reach the North Fork of the Salmon river, while the larch may possibly be found in the Salmon River mountains.

"At the northern extremity of the county, along the Mullan road, which from the Cœur d'Alêne mission follows up the cañon of the Cœur d'Alêne river, instead of following the spurs, a distance of 37 miles, the swampy bottoms were found heavily timbered with *Thuya*, red fir, *Abies grandis*, and *Tsuga Mertensiana*, with some larch and *Pinus monticola*. Some of the drier bottoms had been burned over, and were mostly covered with *Pinus Murrayana*. Some *Populus balsamifera* occurs, 3 feet through, or more (as also on the Montana side). The sides of the ridge were also nearly bare. The *Thuya*, which exclusively occupies some of the swamps, attaining a large size, ceases at the base of the dividing ridge, where also the *Picea Engelmanni* and *Abies subalpina* come in. The range above Cœur d'Alêne cañon, and bounding the county on the north, is not heavily timbered, much of its upper slopes being bare.

"Total timbered area estimated at 5,000 square miles.

"KOOTENAI COUNTY (5,530 square miles).—The portion south of the Cœur d'Alêne and Spokane rivers belongs mostly to the Cœur d'Alêne Indian reservation, and is timbered, with the exception of open meadows upon the Cœur d'Alêne and Saint Joseph rivers and upon Hangman creek. The timber is principally yellow pine and red fir, with some *Pinus Murrayana*, and fine bodies of cedar (*Thuya gigantea*) near the western borders of the lake. North of the Cœur d'Alêne river the road from the mission to the fort passes through a cedar (*Thuya*) swamp, with many large trees, from 3 to 5 feet through, traversing cañons filled with a mixed growth of *Abies subalpina* and *A. grandis*, larch, hemlock, *Picea Engelmanni*, and red fir. This latter growth continues for some miles below the fort, where the valley opens out into the broad Spokane plain, which extends northeastward toward Pend d'Oreille lake without trees. The mountains south of the lake are low and not heavily timbered. The portion of the county north of Clarke's Fork and of Pend d'Oreille lake has, so far as I know, never been explored, but is probably mountainous and for the most part well timbered.

"Estimated timber area of the county, 4,500 square miles."

WASHINGTON.

Washington territory west of the summit of the Cascade range is covered with the heaviest continuous belt of forest growth in the United States. This forest extends over the slopes of the Cascade and Coast ranges, and occupies the entire drift plain surrounding the waters of Puget sound. The highest mountain peaks and the sand-dunes of the coast are treeless. The narrow valleys of the Cowlitz and Chehalis rivers are dotted with small oaks and other deciduous trees, and oaks and stunted yellow pines occupy with an open growth the barren Steilacoom plain south of Puget sound; with these exceptions western Washington territory is covered with a magnificent coniferous forest. The most valuable and generally distributed timber tree of this region is the red or yellow fir (*Pseudotsuga Douglasii*), forming about seven-eighths of the forest growth. The valuable red cedar (*Thuya gigantea*) and the hemlock (*Tsuga Mertensiana*), often covering extensive tracts, especially near the base of the Cascade mountains, are common; the noble tide-land spruce adds value and importance to the forests bordering the coast. The forests which cover the upper ridges of the Cascade mountains are principally composed of firs (*Abies amabilis* and *A. nobilis*), spruces (*Picea Engelmanni*), various small pines, hemlocks, etc. These elevated forests, often of great beauty, are of little economic importance.

East of the Cascade mountains the forests are less dense, and are confined to the mountain ranges. The great plains watered by the Columbia and Snake rivers are entirely destitute of tree covering.

Stevens county, which is broken and mountainous, with the exception of the narrow valleys and occasional small prairies, is covered with a heavy, open forest growth. The most valuable trees of the forests of this county are the red fir, the yellow pine (*Pinus ponderosa*), the white pine (*Pinus monticola*), the larch (*Larix occidentalis*), and the red cedar.

The forests of Spokane county are confined to the spurs and ridges of the extreme eastern part of the county, and consist of the yellow pine, red fir, and larch of small size and inferior quality.

The forests of Yakima county cover about one-half of its area, being confined to the eastern slope of the Cascade range. The forests covering the eastern slopes of these mountains are only surpassed in density and value by those extending over their western flanks. The yellow pine occupies the lowest slopes with an open growth of large trees. Above the pine the red fir is the prevailing tree. This at a greater elevation is succeeded by hemlock and larch, with which are mingled fine bodies of spruce (*Picea Engelmanni*) and hemlock, while the forest growth below the timber-line consists of firs, pines, and mountain hemlock.

The western portion of Klikitat county is covered with heavy forest growth, similar in composition and density to that of Yakima.

Walla Walla county is destitute of timber except in the extreme southeastern corner, where the spurs of the mountains are thinly covered with a sparse growth of yellow pine and larch.

Columbia county is without forest except along the ridges and summit of the Blue mountains, which are covered with yellow pine, larch, and, above 5,000 feet elevation, with a continuous growth of lodge-pole pine (*Pinus Murrayana*).

Whitman county is destitute of forest except in the extreme southeastern corner, where there is a scattered growth of small yellow pine.

An estimate of the actual amount of timber standing in the territory is not possible with the existing knowledge of the country, and none has been attempted. The quantity of merchantable timber, however, standing in western Washington territory is enormous; a yield of 200,000 feet of lumber to the acre is not at all exceptional, while over fully 20,000 square miles a yield of 25,000 feet to the acre might be expected; such estimates certainly would not exaggerate the productive capacity of these noble forests.

The forests of Washington territory, especially in the more thickly settled portions west of the Cascade mountains, have long suffered from destructive fires. The injury inflicted by such fires is proportionately less, however, in the humid coast region than east of the mountains, where the dryness of the climate prevents the reproduction of the forest once destroyed. West of the mountains young trees of the species of the original forest, and especially the red fir, soon densely cover the burned surface and grow with astonishing rapidity and vigor. It seems reasonably certain, therefore, that, whatever may be the fate of the forests which now cover western Washington territory and Oregon, they will be succeeded by forests of similar composition, and that this whole region, ill adapted in soil and topography to agriculture, will retain a permanent forest covering long after the other great forests of the continent have disappeared.

During the census year 37,910 acres of woodland were destroyed by fire, with an estimated loss of $713,200. These fires were set by Indians, by whites in clearing land, by hunters, prospectors, etc.

The forests bordering the shores of Puget sound, the strait of Juan de Fuca, and the lower Columbia river have been culled of their best trees for a distance inland of 1 or 2 miles to supply the important lumber-manufacturing interests of this part of the territory. The product of western Washington territory during the census year was 153,986,000 feet of lumber, 6,550,000 laths, 910,000 shingles, and 23,666,000 staves—by far the largest part being manufactured in the mills located on the waters of Puget sound.

The first saw-mill built upon Puget sound was erected in 1851. It was a small water-power mill, with a daily capacity of about 1,000 feet. Two years later a similar mill was erected at Seattle, with a daily capacity of from 8,000 to 10,000 feet.

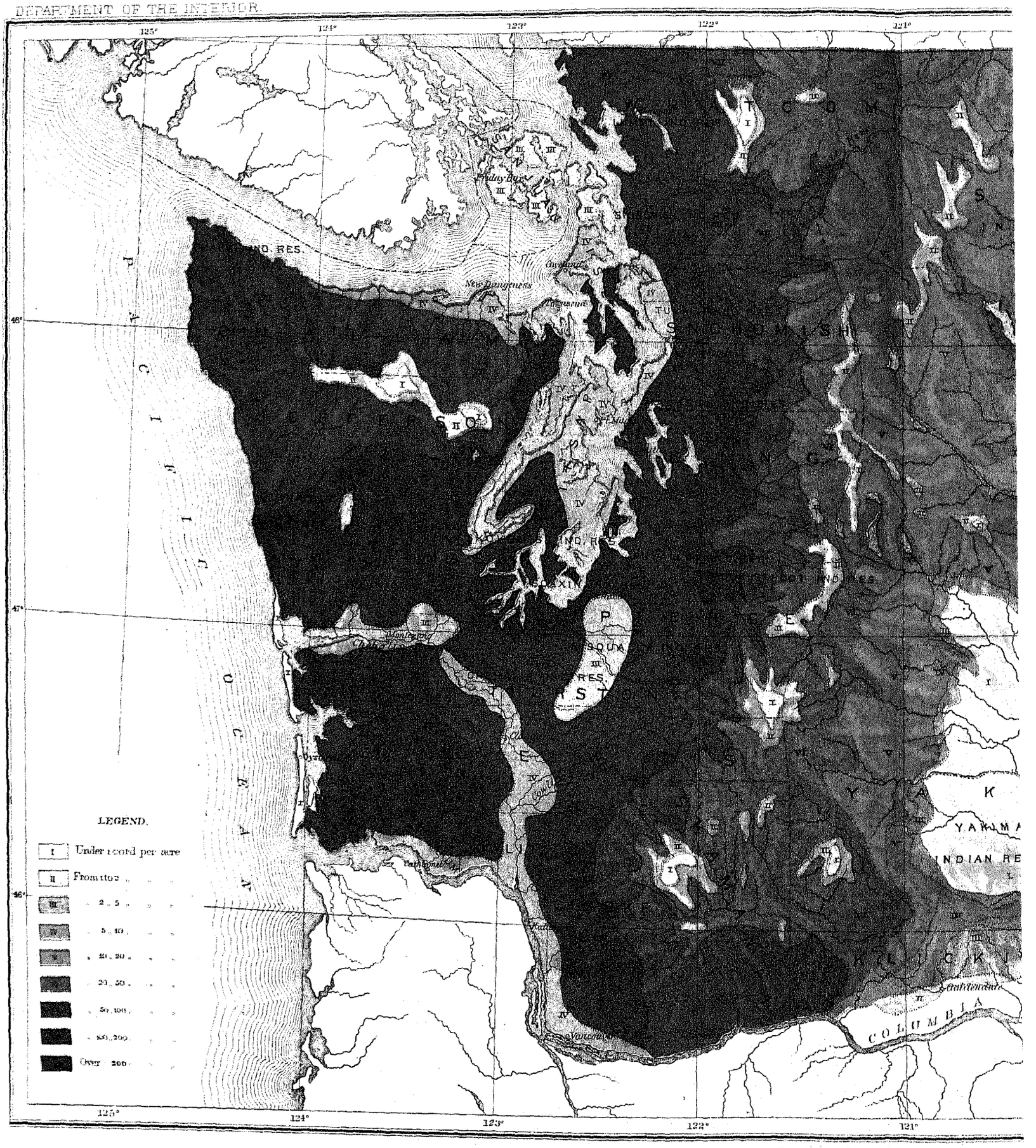
The centers of manufactures now are Port Gamble, Port Madison, Port Blakely, Port Discovery, Seabeck, Utsaladdy, Tacoma, and Seattle. At the last-named place there is a large establishment manufacturing sugar-barrel staves from cottonwood for the San Francisco market.

The lumber manufactured upon Puget sound is largely shipped to San Francisco and directly to China, Australia, New Zealand, and Mexican and South American Pacific ports.

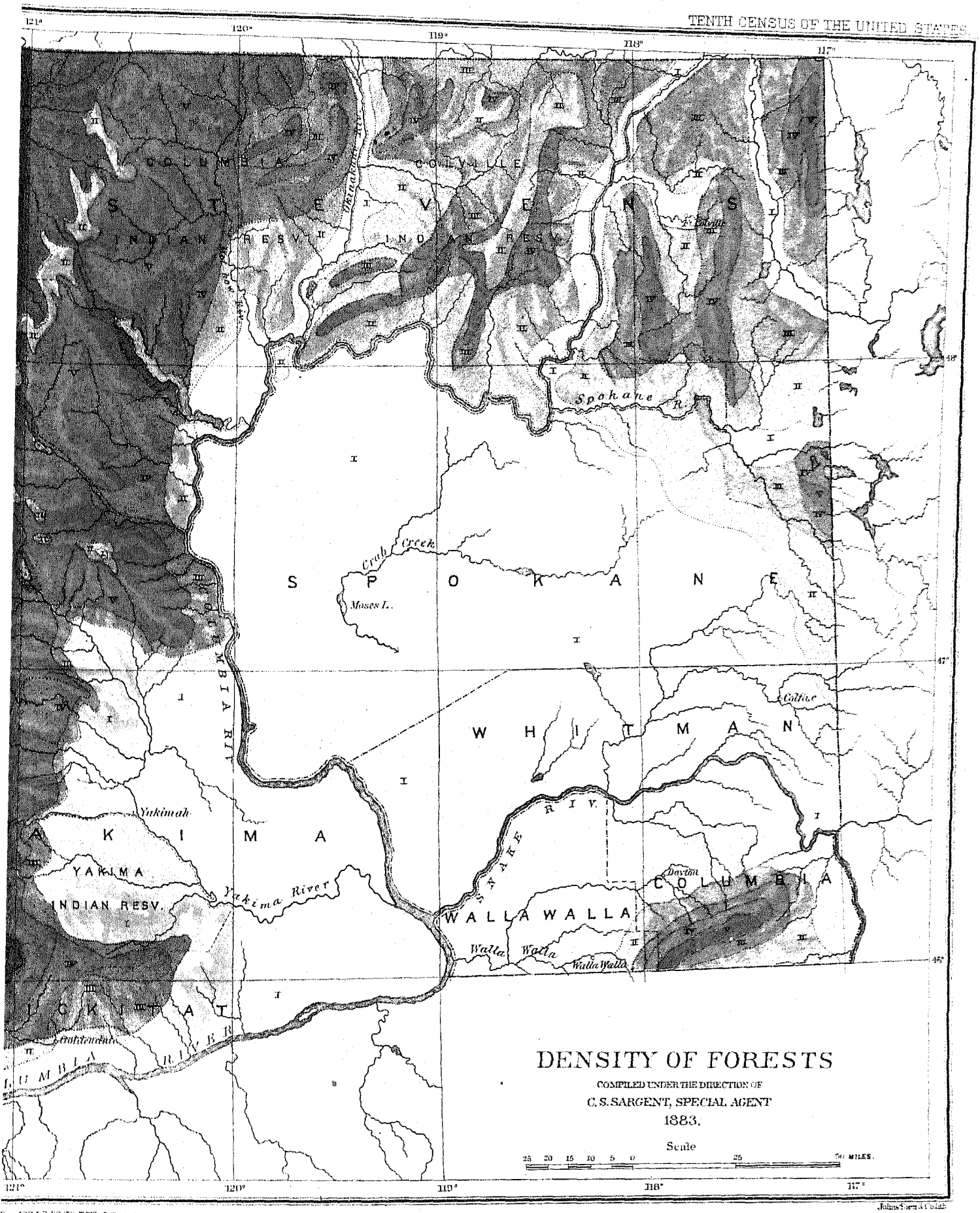
The population of the southeastern part of the territory is principally supplied with lumber, largely coarse yellow pine of inferior quality, cut on the Blue mountains in small portable mills, and delivered at Dayton, in Walla Walla county, by a flume several miles in length. No statistics, however, have been received of the amount of lumber manufactured in this county.

The methods adopted by the lumbermen of western Washington territory are wasteful in the extreme. Loggers cut only timber growing within a mile or a mile and a half of shores accessible to good booming or shipping points, or which will yield not less than 30,000 feet of lumber to the acre. Only trees are cut which will produce at least three logs 24 feet long, with a minimum diameter of 30 inches. Trees are cut not less than 12 and often 20 feet from the ground, in order that the labor of cutting through the thick bark and enlarged base may be avoided, while 40 or 50 feet of the top of the tree are entirely wasted.

DEPARTMENT OF THE INTERIOR.



WASHINGTON TERRITORY



DENSITY OF FORESTS

COMPILED UNDER THE DIRECTION OF

C. S. SARGENT, SPECIAL AGENT

1883.

Scale

25 20 15 10 5 0 25 50 MILES.

The following notes upon the forests of eastern Washington territory are extracted from Mr. Watson's report:

"WALLA WALLA COUNTY (1,260 square miles).—This county is wholly without timber, which is supplied from the Blue mountains of Oregon.

"COLUMBIA COUNTY (2,160 square miles).—A spur of the Blue mountains traverses the southern portion of this county, occupying about a fourth of its area, which is partially timbered, chiefly with red fir (*Pseudotsuga*), pine (*Pinus ponderosa*), and some *Picea Engelmanni*, none of it large. Elsewhere the county is nearly destitute of trees, though some of the streams, especially the Touchet, were at the first settling of the county bordered by scattered pines.

"WHITMAN COUNTY (5,000 square miles).—This county is destitute of timber. Some of the townships along the Idaho line were originally sparingly wooded with scattered pines upon the ridges, but these have nearly or wholly disappeared, and the supplies for fencing and fuel are brought from the neighboring mountains of Idaho. There is a saw-mill on the Palouse river, at Palouse, the logs for which are floated down from about 9 miles above.

"SPOKANE COUNTY (8,500 square miles).—The portion of this county to the west of the mouth of the Spokane river is wholly destitute of trees, with the exception of the high point or plateau opposite to the mouth of the Okinakane river. Here there is a small area thinly wooded, probably with yellow pine and red fir. On the eastern side of the county spurs from the mountains bordering Cœur d'Alêne lake enter between Rock creek and Spokane river, and are covered more or less densely with a growth of yellow pine, often small, with some Douglas spruce and tamarack in the ravines. There is a saw-mill at Rock creek supplied from its immediate neighborhood. Crossing Hangman's creek a scattered growth of pine appears upon the ridges between Deep creek and the Spokane river, and as far west as the head of Crab creek. Trees also border the Spokane river below the falls and to within a few miles of its mouth. The region between the Spokane and Little Spokane rivers is mostly a broad, open valley, the hills bordering it upon the north being very thinly wooded. There are two saw-mills at Spokane Falls, but the logs for them are floated down from near Cœur d'Alêne lake.

"The total area more or less covered with trees may be estimated at from 400 to 500 square miles.

"STEVENS COUNTY (14,760 square miles).—This county is broken and mountainous throughout, but with no high ranges east of the Cascade mountains. The portion lying east of the upper Columbia and north of the Spokane river has several small prairies upon Chamokane creek and Colville river, and there is a narrow, open valley along the Columbia for 20 miles below the mouth of the Colville. The mountains are all low, the ridges most frequently thinly wooded or nearly bare, with the timber becoming denser in the ravines, especially northward. The most common tree is the yellow pine, but in the ravines red fir is frequent, with tamarack and lodge-pole pine. Near the Colville river were seen *Picea Engelmanni*, *Abies grandis*, small *Thuyas*, and fine specimens of *Pinus monticola*, as well as *Populus balsamifera*, *Betula papyracea*, and *Alnus* of considerable size. The hills bordering the Columbia above Old Fort Colville are treeless. The drift-wood brought down by the river is said to be chiefly cedar (*Thuya gigantea*).

"The Colville Indian reservation, lying between the Okinakane and the Columbia eastward, is comparatively little known, being crossed by but two trails, one leading directly westward from Old Fort Colville, the other following the Kettle river, and for much of the way not far distant from the British boundary. As seen from the Columbia and from the heights bordering the Okinakane, this portion appears to be more open and grassy than that east of the Columbia, and, especially toward the south, more like the bare plateau of Spokane county. Okinakane valley itself is narrow, with mainly a desert vegetation of sage-brush, *Purshia*, and other like representatives of the Great Basin flora, which seems to find here its only passageway northward to the British boundary. The hills eastward have thinly-scattered pines, which occasionally descend into the valley. The northern trail from Old Fort Colville shows the lower valley of Kettle river to be well wooded, but above, opening out into grassy prairies and bordered by grass-covered hills or with scattered yellow pine, red fir, and larch. Upon the more densely wooded ridges and ravines were also found *Picea Engelmanni*, *Abies subalpina*, *Pinus Murrayana*, and *Thuya*.

"The main ridge separating Kettle river from the Okinakane (about 5,000 feet high and 12 miles from the latter stream) was well grassed upon both sides with large *Picea*, *Pseudotsuga*, *Pinus ponderosa*, and *Larix* along the creeks upon the eastern side, and on the west the *Pinus ponderosa* only. The ridges above the Okinakane to the north appeared treeless, while the northern slopes of the nearer hills to the south were pretty well covered with underbrush. West of the Okinakane, between that river and the Methow, the country is much like that to the east—high and broken, with scattered patches of timber, which becomes more general toward the northern boundary. Upon the Methow and Similkameen creeks there are open, grassy valleys of considerable extent, but for 12 miles from the mouth of the Methow the hills close in upon it and are considerably wooded. The rest of the county, from the Methow to the Wenatchee, is occupied by spurs from the Cascade mountains, which reach the banks of the Columbia; these are exceedingly rugged and almost impassable, being seldom traversed, even by Indians. A foot-trail leads from the headwaters of the Methow over to the Skagit, and a trail which has been passable for horses crosses the ridges between the upper Chelan lake and the Wenatchee, but it is described by the Indians as dangerous and long disused by them. The whole region is probably for the most part well timbered except along the Columbia river, where the mountains for from 10 to 15 miles back are but scantily wooded, the pine (*Pinus ponderosa*) and red fir occasionally reaching to the river. Heavy timber is reported about the head of Chelan lake, commencing at about 15 miles from

the foot, mostly yellow pine, but also red fir, some *Larix*, and small *Thuya*. The outlet to this lake is through a deep cañon, and is obstructed by falls and rapids. The Wenatchee flows through a more open valley, and, at least in high water, could be used for floating timber to the Columbia. For 7 miles from its mouth the ridges on each side are only scantily wooded, but from that point the trees (yellow pine and red fir, mostly young) occupy the valley, and at 20 miles the thick timber begins—pine, fir, red fir, larch, white pine (*Pinus monticola*), and cedar, the white pine sometimes 4 feet through, the cedar not large.

"YAKIMA COUNTY (8,900 square miles).—Immediately south of the Wenatchee the highest of the eastern spurs of the Cascade mountains extends in a southeasterly direction to the Columbia, forcing that river to make a bend eastward. This spur has an altitude of about 5,000 feet, and its higher northern slopes, overlooking the mouth of the Wenatchee and eastward, are somewhat densely covered with pine, red fir, and larch. The southern slope, as seen from Ellensburg, appeared nearly bare. I crossed the ridge about 17 miles above the mouth of the Wenatchee and a few miles east of the high, exceedingly rocky, and snow-covered peaks called by McClellan 'Mount Stuart'. It was found mostly well wooded, but the trees not exceeding 1 or 2 feet in diameter, and usually small red fir and yellow pine, with at length some *Abies grandis* and *Pinus monticola*, rarely a small *Thuya*, on the higher rocky ridges small larches, and at the summit some *Pinus Murrayana*. The same trees were found on the southern descent, excepting the *Pinus monticola*. Large cottonwoods (*Populus trichocarpa*) occurred on the creeks. South of this range the spurs recede, leaving a comparatively level sage-brush region, wholly treeless, from 50 to 70 miles broad, between the Columbia and Yakima, and crossing the lower portion of the latter river.

"Below the mouth of the Schwank, which is at the head of what is known as 'Killitas valley', on the Yakima, the foot-hills of the Cascade mountains extend to the Yakima river, a distance of about 50 miles from the summit of the range; but the lower portions of these spurs are bare, or with only scattered pines on their northern slopes, and the chief reliance of the settlers for fencing and fuel is upon the aspens and cottonwoods bordering the streams. Following up the Yakima from the mouth of the Schwank, the valley for 10 or 12 miles is thinly timbered with pine and red fir. For 17 miles more there is some larch on the ridges, and in the bottoms some *Abies grandis*, and rarely a small *Thuya*. Timber and ties had been extensively cut here for the railroad and floated down the river. At this point the yellow pine and tamarack ceased, and a dense, heavy growth began and continued for most of the way to the summit (20 or 25 miles), consisting of red fir, hemlock, *Abies grandis* and *A. amabilis* (all these from 3 to 5 feet through and 200 feet high or more), *Pinus monticola* (18 inches through), and *Thuya* (2 feet in diameter). One spruce, not over 2½ feet through, had a height of 225 feet.

"In like manner, upon the Nachess river, the open sage-brush country extended about 10 or 12 miles from its mouth, with only cottonwood along the stream. Scattered pines then commence, with at length red fir, but it is some 25 or 30 miles more before heavy timber is reached. A small grove of oak (*Quercus Garryana*) is found at the mouth of the Schwank, the only point upon the Yakima where it occurs. It is also frequent along the Nachess for 3 or 4 miles, commencing at about 12 miles from its mouth, but small and rarely over 6 inches in diameter or 15 feet in height. In Satas valley it is abundant. Along the southern border of the county there is again a long spur extending east from mount Adams to within about 40 miles of the mouth of the Yakima. This spur has an altitude of about 1,500 feet, and is mostly covered with a scattered growth of yellow pine, red fir, and *Abies grandis*.

"The entire wooded area of the county may be estimated at about 4,500 square miles.

"KLIKITAT COUNTY (2,300 square miles).—The spur eastward from mount Adams, just spoken of, covers much of the northern portion of this county and affords a good supply of excellent timber. The area may be estimated at 750 square miles. The high ridge overlooking the Columbia from The Dalles eastward is perfectly bare of trees."

OREGON.

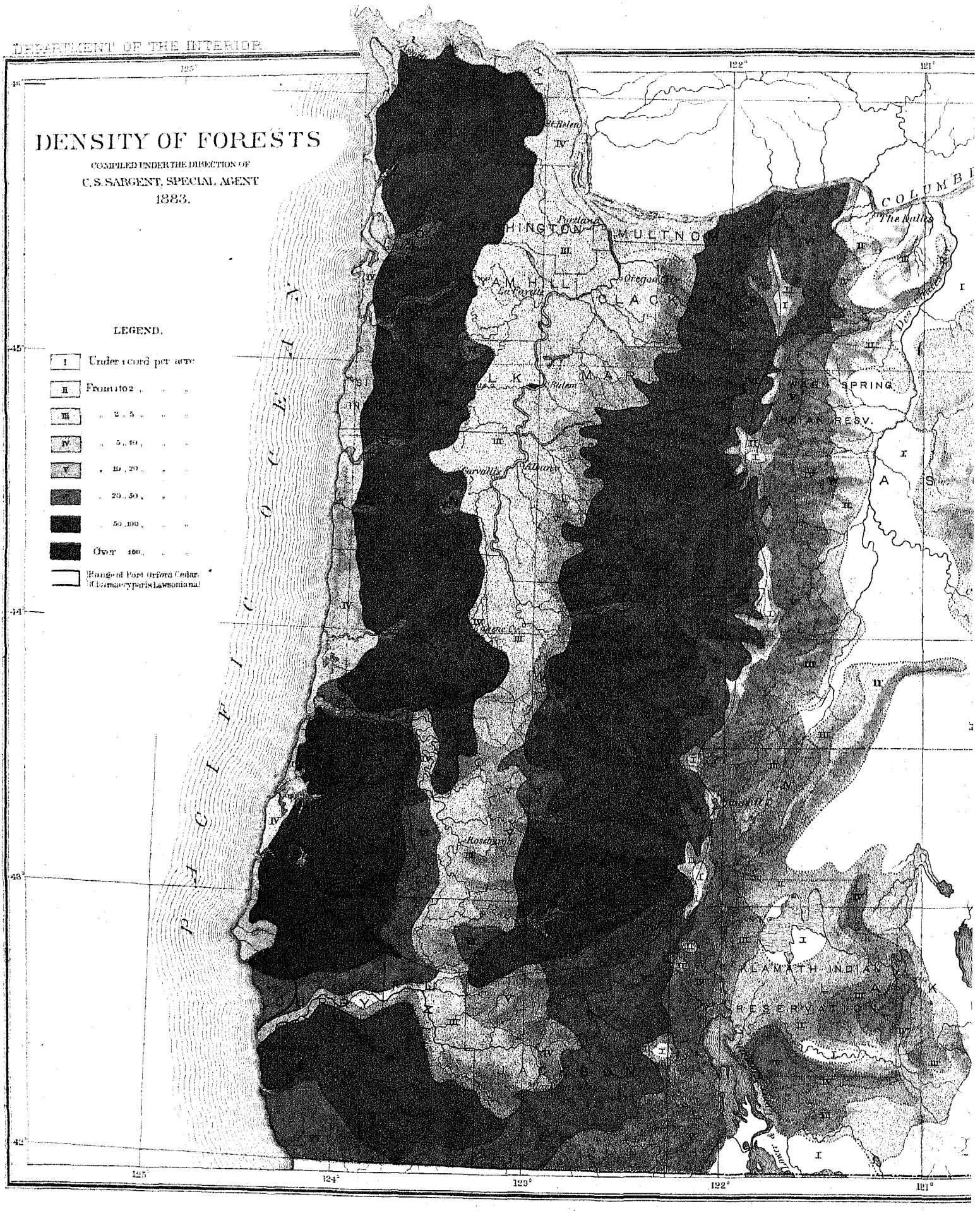
The heavy forest of western Washington territory extends through western Oregon. The most valuable timber tree of the region is the red or yellow fir (*Pseudotsuga Douglasii*), which forms fully seven-eighths of the forest. The tide-land spruce (*Picea Sitchensis*) abounds along the coast, and the red cedar (*Thuya gigantea*) and the hemlock (*Tsuga Mertensiana*) are common and of large size. South of Coos bay an important forest of Port Orford cedar (*Chamæcyparis Lawsoniana*), mixed with the red fir and the tide-land spruce, occurs.

The valleys of the Willamette, Umpqua, and Rogue rivers contain an open, scattered growth of white oak (*Quercus Garryana*), now gradually increasing by the recent growth of young trees protected from the fires which formerly swept every season through these prairie-like valleys. South of the Rogue River valley the sugar pine (*Pinus Lambertiana*), the chestnut oak (*Quercus densiflora*), and other trees of the California forest occur in sufficient numbers to add economic value to the forests of the state.

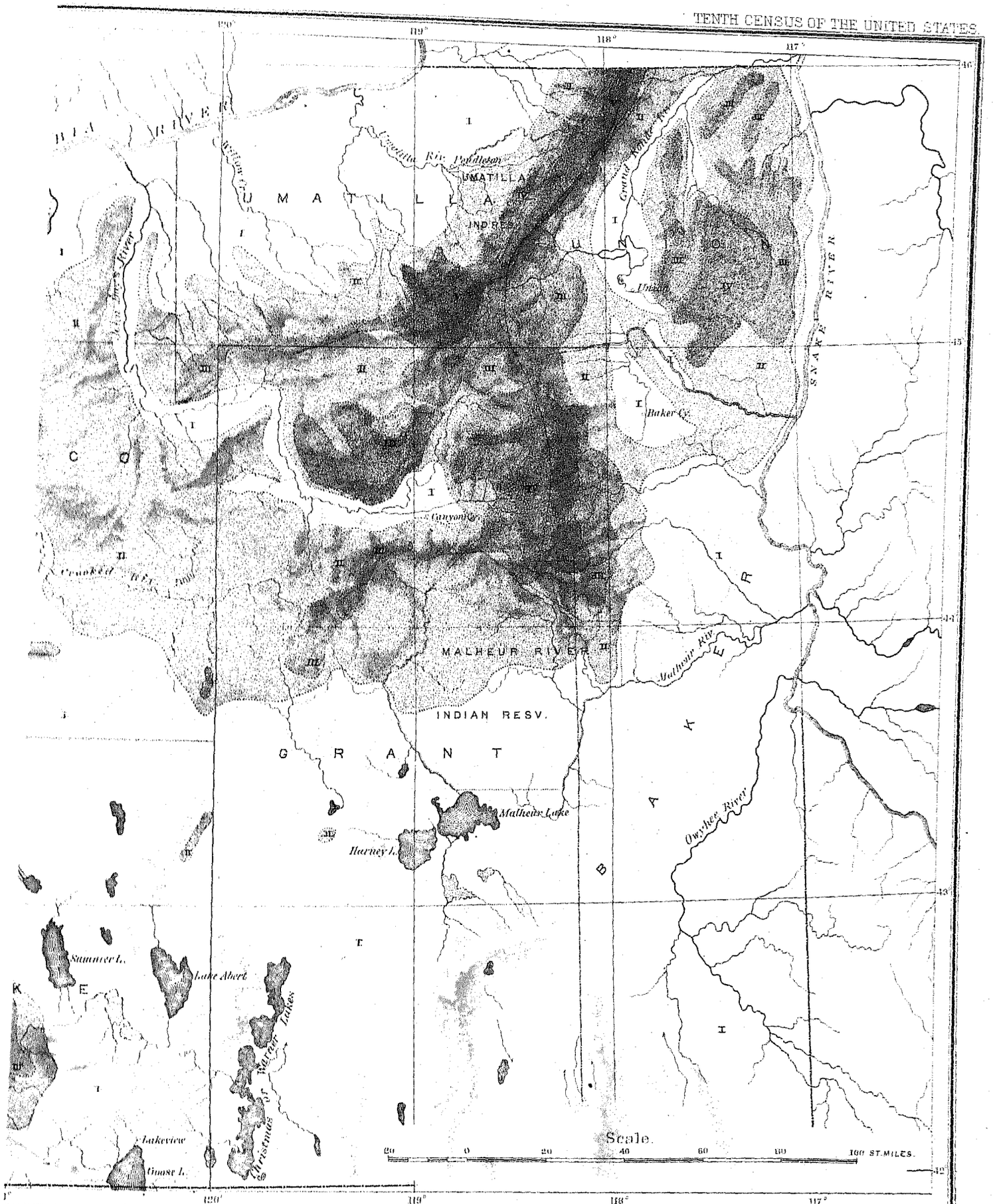
The bottom lands of western Oregon are lined with a continuous growth of cottonwoods of immense size, willows, maples, ashes, and gigantic alders; those in the southwest, near the coast, contain great bodies of splendid curled maple (*Acer macrophyllum*) and laurel (*Umbellularia Californica*).

East of the Cascade mountains the forests are confined to the mountain ranges; they are open, scattered, and generally composed of comparatively small trees.

DEPARTMENT OF THE INTERIOR



OREGON



Julius Bien & Co. lith.

The forests of Wasco county, on the western slope of the Cascade range, when above 3,000 feet elevation are important. The most valuable trees are the red fir, the yellow pine, and the larch. The eastern part of the county is covered with a light growth of pine, principally yellow pine.

The slopes of the Blue mountains in Umatilla and Union counties are covered with an open, stunted forest, consisting of red fir, yellow pine, larch, and, above 4,000 feet elevation, a heavier continuous growth of lodge-pole pine (*Pinus Murrayana*).

Lake county is destitute of timber except on the eastern slope of the Cascade mountains and the southern part of the county, which contain a light forest growth confined to the high ridges of the mountains, and principally composed of yellow pine.

Grant and Baker counties are treeless except in the northern part, where the Blue mountains are covered with a light, open growth composed chiefly of yellow pine, with some larch and scrub pine.

The forests of Oregon have suffered serious losses from forest fires. Along the Coast Range, from the Columbia river to Port Orford and through the entire length of the Cascade mountains, fires have raged nearly every summer since the first settlement of the state, destroying thousands of acres of noble fir, spruce, and cedar. Forests similar in composition to those destroyed soon spring up again and cover the burned surface, but the loss in material which the state has suffered in this way is incalculable.

Forest fires are increasing in frequency, especially west of the summit of the Cascade mountains. During the census year, however, only 132,320 acres of woodland were reported destroyed by fire, with an estimated loss of $593,850. These fires were set by hunters, Indians, and by farmers clearing land.

The abundant spruce, cedar, cottonwood, ash, maple, and alder of western Oregon have developed flourishing industries. At Portland large quantities of ash, maple, and alder are manufactured into furniture, and cottonwood, spruce, and cedar supply numerous establishments engaged in the production of cooperage stock and all kinds of woodenware. The supply of this material is large and of excellent quality.

The principal centers of the lumber-manufacturing interests are at Portland, where fir, spruce, cottonwood, and hard woods are sawed for the local market, and at Empire City and Marshfield upon Coos bay. Port Orford cedar and red-fir lumber are manufactured here, and shipped by schooner to Portland, San Francisco, and Mexican and South American Pacific ports. The first mill was established upon Coos bay, at North Bend, 4 miles above Empire City, in 1853; other mills were soon built, and in 1854 the first shipment of Port Orford cedar was made to San Francisco. Great quantities of this timber have been cut, while fires have destroyed even more than the ax. The fire which raged through the forests of Coos bay for three months in the summer of 1867 destroyed cedar estimated to amount to between 200,000,000 and 300,000,000 feet of lumber. This tree, however, reproduces itself very rapidly, and after the forest has been burned over it is the first arborescent species to reappear, springing up generally in the third year.

The heaviest continuous body of Port Orford cedar now standing is on cape Gregory, extending south to and beyond the mouth of the Coquille river. It is about 20 miles long by an average width of 12 miles, and lies along the western slope of the foot-hills of the Coast Range, extending to within 3 miles of the coast. In this forest two-thirds of the trees are Port Orford cedar, the others tide-land spruce and a few red firs. There is great danger, however, that the Port Orford cedar, one of the most valuable trees of the American forest, will soon be exterminated as a source of lumber supply, so far as this generation is concerned.

The following notes upon the forests of Wasco, Umatilla, Union, Grant, and Baker counties, the only portion of the state visited by Mr. Watson, are extracted from his report:

"WASCO COUNTY (17,760 square miles).—The timber of this county is confined almost wholly to the steep eastern slopes of the Cascade range; the low spurs of the Blue mountains, which enter the county on the east, bordering John Day's river and southward, being only partially supplied with pines, etc. I know nothing about Walker's range and the Paulina mountains in the southwest, but they are probably low, with little or no wood. The trees of the Cascades are doubtless nearly the same as those to the north of the Columbia, the larch reaching to the headwaters of the Deschutes river, the most southern locality for it that I have seen mentioned.

"The total more or less wooded area may be estimated at from 2,500 to 3,000 square miles.

"UMATILLA COUNTY (6,100 square miles).—The Blue mountains occupy the southern and eastern borders of this county, and are the only source of timber. They are for the most part well wooded, especially in the ravines, the trees growing to a fair size, and consisting of yellow and scrub pine, spruce and balsam (*Abies subalpina* and *A. grandis*).

"The wooded area is about 1,500 square miles.

"UNION COUNTY (4,300 square miles).—This county has the main range of the Blue mountains on the west and north and the Cedar mountains on the east, separated by the valleys of the Grande Ronde and Wallowa rivers. A large portion of these mountains is well timbered, the amount decreasing toward the east.

"The wooded area may be estimated at about 2,000 square miles.

"GRANT COUNTY NORTH OF LATITUDE 44° (5,800 square miles).—This portion of the county is traversed by the valley of John Day's river, to the north and east of which lie the main ranges of the Blue mountains, which are to a considerable extent well wooded. The mountains to the south are low and probably scantily timbered.

"Fifteen hundred square miles is probably a liberal estimate for the wooded area.

"BAKER COUNTY NORTH OF LATITUDE 44° (3,800 square miles).—This section is bordered on the west by a high range of the Blue mountains, which is well timbered. The remainder is almost wholly without timber.

"The estimated wooded area of this county is 900 square miles."

CALIFORNIA.

The heavy forests of California are confined to the Coast Range, the eastern and western slopes of the Sierra Nevada, and the group of mountains joining these ranges in the northern part of the state. They extend from the Oregon boundary south to latitude 34° 30′ north. The most important trees of the Coast Range forest are the redwood and the red fir. The tide-land spruce and the hemlock of the Northern Coast Forest extend as far south as cape Mendocino, although less generally multiplied and less valuable than in Oregon and Washington territory. The chestnut oak (*Quercus densiflora*), of which the bark is largely used in tanning, is still common in the coast forests of the northern part of the state. The most valuable forest of the western slope of the Sierra Nevada is confined to a belt between 4,000 and 8,000 feet elevation, consisting of the sugar pine (*Pinus Lambertiana*), the yellow pine, and the red fir. Small scattered groves of the big trees (*Sequoia gigantea*) stretch along the southern portion of this belt. The western slopes of these mountains below 4,000 feet elevation are more or less densely covered with various species of pine of little economic importance, and the broad valleys of the Sacramento and the San Joaquin, lying between the Coast Range and the Sierra Nevada, are covered, except at the south, with an open growth of oaks, often of immense size, although of little value except as fuel. The eastern slopes of the Sierra Nevada are covered with a heavy forest, in which yellow pines (*Pinus ponderosa* and *P. Jeffreyi*) are the prevailing and most important trees.

South of latitude 36° 30′ the forests, both of the Sierra Nevada and of the Coast Range, become gradually less heavy and less valuable than those covering the mountains farther north. Two degrees still farther south they are open and scattered, and have little economic value. The pine and fir forests, however, which cover the upper slopes of the San Bernardino and San Jacinto ranges are important on account of their isolated position in a region destitute of tree covering, and supply a considerable local market with lumber.

The northeastern and nearly all the southern and southeastern portions of the state are almost entirely destitute of forest covering. Oaks and occasional pines and junipers are, however, dotted over the low mountains of southwestern California, and willows and cottonwoods line the banks of streams. Forests of pine crown the highest ridges of the Inyo and other mountain ranges, rising from the desert east of the Sierra Nevada, and arborescent yuccas (*Yucca brevifolia*) form upon the high Mohave plateau an open forest, more remarkable in the strangeness of its growth than in economic value.

The narrow belt of redwood which extends along the western slopes of the Coast Range from the bay of Monterey to the northern boundary of the state is the most important forest of similar extent now standing. Few trees equal the redwood in economic value. No other forest can compare with this in productive capacity, and no other great body of timber in North America is so generally accessible or so easily worked. Single trees capable of producing 75,000 feet of lumber are not uncommon, while a yield of from 1,000,000 to 2,000,000 feet of lumber per acre is by no means rare. The redwood has already been practically destroyed in the neighborhood of San Francisco bay, both north and south, and through the entire extent of this forest the trees most accessible to streams and railroads have been culled. Heavy bodies of redwood are still standing, however, in the Santa Cruz region, and in Humboldt county in the valleys of Eel and Mud rivers and Redwood creek. The largest number of mills engaged in the manufacture of redwood lumber are located upon Humboldt bay, principally at Eureka and Arcata. The logs which supply these mills are generally cut within a distance of 1 or 2 miles from the shores of the bay, to which they are hauled by teams, made into rafts, and towed to the mills. Attempts made to raft logs down the mountain streams watering the redwood forests have not been successful. The rivers flowing west from the California Coast Range are short and rapid. Floods following the winter rains are sudden and severe, breaking up rafts and driving the logs out to sea, or lodging them far from the banks. At periods of low water numerous bars close these rivers to the navigation of the enormous redwood logs. The general destruction of these forests must therefore be accomplished by means of short logging railroads specially constructed to bring logs to the mills. Such a road has been built along Mad river, and there are others either built or projected near Trinidad and at other points along the coast.

Besides the mills upon Humboldt bay, there are others devoted entirely to the manufacture of redwood lumber at Crescent City, in Del Norte county; Trinidad, Rohnerville, and Bridgeville, in Humboldt county; Westport, Kibesillah, Albion, Little River, Caspar, Mendocino, Cuffey's Cove, Punta Arena, and Gualala, in Mendocino county; Duncan's mills, in Sonoma county; and at Santa Cruz.

Redwood lumber is principally shipped by schooner to San Francisco, the great point of lumber distribution upon the Pacific coast, and also direct by water to Wilmington, San Diego, and other ports of southern California, and to Mexico and South America.

DENSITY OF FORESTS

COMPILED UNDER THE DIRECTION OF

C. S. SARGENT, SPECIAL AGENT

1883.

Scale.

LEGEND.

I	Under 1 cord per acre
II	From 1 to 2 " " "
III	" 2 " 5 " " "
IV	" 5 " 10 " " "
V	" 10 " 20 " " "
VI	" 20 " 50 " " "
VII	" 50 " 100 " " "
VIII	" 100 " 200 " " "
	Over 200 " " "

CALIFORNIA

Julius Bien & Co. lith.

The following estimates of the amount of accessible redwood standing May 31, 1880, were prepared by Mr. E. L. Allen, secretary of the Redwood Manufacturers' Association of San Francisco. They embrace only such portions of the forest as can be reached by water, or may in the future be penetrated by railroads, and do not include the small, isolated bodies of timber growing in inaccessible cañons:

REDWOOD (*Sequoia sempervirens*).

Regions.	Feet, board measure.
From the Oregon boundary to the mouth of Redwood creek	800, 000, 000
From the mouth of Redwood creek to the mouth of Mad river	9, 000, 000, 000
From the mouth of Mad river to the mouth of Eel river	2, 145, 000, 000
From the mouth of Eel river to the mouth of Mattoli river	4, 450, 000, 000
From the mouth of Mattoli river to the mouth of Cotonavia creek	200, 000, 000
From the mouth of Cotonavia creek to the mouth of Russian river	7, 680, 000, 000
In the Santa Cruz region	1, 550, 000, 000
Total	25, 825, 000, 000
Estimated cut for the census year ending May 31, 1880:	
Sawed lumber	125, 390, 000
Shingles and shakes	25, 380, 000
Split railroad ties	23, 265, 000
Posts, etc	12, 600, 000
Total	186, 635, 000

No estimate of the amount of pine and fir lumber standing in the state is now possible, and none has been attempted. An enormous amount of pine of excellent quality, both white and yellow, is contained in the sierra forests. These forests have been invaded by the lumberman at only a few points; their inaccessibility and the cost of getting to market the lumber manufactured in these mountains have thus far preserved them, and these sierra forests, if protected from fire, will serve as a reservoir from which the whole Pacific coast can draw its lumber supply long after its more accessible forests have disappeared.

The forests of California suffer seriously by fire; during the census year 356,815 acres of woodland were reported thus destroyed, with an estimated loss of $440,750. These fires were set by careless hunters, prospectors, and by farmers in clearing land. Great injury, every year becoming greater, is inflicted on the mountain forests by stockmen starting fires to improve the herbage of the alpine pastures. These fires destroy undergrowth and young trees, and often consume great quantities of valuable timber, which does not grow again upon these exposed mountain slopes.

PASTURAGE OF MOUNTAIN FORESTS.

The permanence of the mountain forests of California is severely endangered, moreover, by the immense herds of sheep, cattle, and horses driven into the mountains every year, at the commencement of the dry season, to graze. From the foot-hills to the highest alpine meadows every blade of herbage and every seedling shrub and tree is devoured. Young trees are barked and ruined, and only the most rigid and thorny chaparral shrubs are able to resist the attacks of these ravenous herds. The sharp hoofs of sheep winding around the steep acclivities tread out the roots of grasses and other perennial plants and loosen the surface of the stony soil, which, deprived of the protection of its vegetable covering, is gradually washed into the valleys, choking the bottoms of streams and preparing the way for the disastrous torrents which must follow the destruction of the sierra forests; and the destruction of these forests is certain, if the practice of using them indiscriminately as sheep pastures is continued. The life of any forest in which all young trees are destroyed as soon as they appear above the surface of the soil is limited to the life of the fully grown individuals which compose it. A period of unusual climatic conditions, the demand of an increased population for lumber, or the now unforeseen attacks of some insect enemy may at any time sweep away the old trees of the sierra forests. There are no young trees growing to replace them, and it is doubtful if the forest could ever regain its foothold upon the steep and exposed slopes of these mountains once entirely stripped of the protection of their present covering of trees.

The sheep which threaten the destruction of the sierra forests threaten also the agricultural prosperity of the state; the streams heading in the sierras and watering the great interior valleys of California are protected in their flow by the forests growing about their upper sources. If these forests are destroyed, and the protection to the surface of the ground which they afford removed, the immense accumulation of the winter's snows must melt suddenly in the spring; brooks will become torrents, sweeping with irresistible force gravel and stones from the mountain sides down into the valleys below, and burying rich bottom lands in ruin. And this is not the only danger which must follow the destruction of these forests. If the snow which supplies the mountain streams melts slowly, a steady flow of water will be maintained late into the season; if, on the other hand, the snow melts suddenly and rapidly during the first warm days of spring, the unnatural flow of water in the stream must be followed by

its equally sudden disappearance, and the torrent will suddenly diminish to a slender brook or entirely disappear. Irrigation, without which agriculture in a large part of the Pacific region is impossible, is dependent upon the constant and steady flow of streams formed by melting snow, and as the forests which cover the mountain sides are essential to prevent the sudden melting of snow, their preservation is necessary for successful irrigation on any large or comprehensive scale.

The forests of California suffer from wasteful methods of cutting. Only the best and most accessible young trees are cut; often a noble pine capable of producing 25,000 or 30,000 feet of lumber is felled, a few split shingles made from the butt-cut, and the rest of the tree left to rot upon the ground. The preference of the railroad companies of the state for split rather than sawed redwood ties causes an immense and needless waste of this valuable timber. A great amount of material under the most favorable conditions is wasted in splitting out the ties, and when trees after being cut are found to split badly from any defect in the grain they are abandoned and left to waste.

The forests of California, unlike those of the Atlantic states, contain no great store of hard woods. The oaks of the Pacific forests, of little value for general mechanical purposes, are unfit for cooperage stock. No hickory, gum, elm, or ash of large size is found in these forests. California produces no tree from which a good wine cask or wagon wheel can be made. The cooperage business of the state, rapidly increasing with the development of grape culture, is entirely dependent upon the forests of the Atlantic region for its supply of oak. Woodenware and small cooperage stock are manufactured in large quantities, however, from cottonwood, spruce, alder, and red and white fir. Wine-butts and water-tanks are universally made from redwood, which is probably unsurpassed for such purposes.

The large tanning industry of the state consumes, in preference to all other material, large quantities of the bark of the chestnut oak (*Quercus densiflora*), once a common tree in the forests of the northern Coast ranges, but now becoming scarce and in danger of speedy extermination.

The principal centers of lumber manufacture outside of the redwood belt are situated along the line of the Central Pacific railroad, upon both flanks of the Sierra Nevada mountains, in Butte, Tehama, and Mono counties, and in the San Bernardino mountains. Lumber manufactured upon the eastern slope of the Sierra Nevadas is largely shipped eastward by rail to supply Nevada and Utah. The product of the mills situated west of the mountains is largely sent to San Francisco for distribution, or direct by rail to the mining centers of southern Arizona and New Mexico.

ALASKA.

Little is known to me of the present condition or productive capacity of the forests of Alaska. Their distribution, as shown on the forest map of North America, is based upon notes made by Mr. Ivan Petroff, a special agent of the Census Office, who has traced the timber limits of the territory, aided by Mr. C. W. Nelson, of the Smithsonian Institution, by whom the northern limits of the spruce forest are laid down.

The forests of the territory of any commercial value are confined to the islands and Coast ranges east and south of Prince William sound. The most valuable tree of this region is the Sitka cedar (*Chamæcyparis Nutkaensis*). The hemlock, the tide-land spruce, and the red cedar (*Thuya gigantea*) attain here also a considerable size. The importance, however, of these forests, both in extent and in the value of the timber they contain, has generally been greatly exaggerated. The Coast Forest north of the fiftieth degree of latitude rapidly diminishes in density and quality, and there is nothing in the climate or soil of Alaska to produce a forest growth more valuable than that covering the Coast ranges of British Columbia.

A few saw-mills of small capacity are located at different points in southeastern Alaska to supply the local demand for coarse lumber. Alaska is, however, largely supplied with lumber from Puget sound. The treeless Shumagin and Aleutian islands and the southern settlements of the peninsula are supplied with fire-wood brought from other portions of the territory.

MAP
OF A PORTION OF
CALIFORNIA
SHOWING THE DISTRIBUTION OF THE
REDWOOD FORESTS
WITH SPECIAL REFERENCE TO THE
LUMBER INDUSTRY.

COMPILED UNDER THE DIRECTION OF

C. S. SARGENT, SPECIAL AGENT.

1881.

LEGEND

- Standing Redwood (Sequoia sempervirens)
- Standing Redwood averaging 200,000 feet to the acre
- Region containing scattering bodies of inaccessible Redwood of little commercial value
- Region from which all merchantable Redwood has been removed

* *Large quantities of Redwood timber have been cut from these areas, generally along the streams, and in bodies too small to be indicated on the map.*

Scale:

30 15 30 0 30 60 90 120 150 180 MILES.